COMPAQ

Professional Workstation AP500

Maintenance and Service Guide

Second Edition (March 1999)
Part Number 338534-002
Spares Part Number 338561-001
Compaq Computer Corporation

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About This Guide

This guide is designed to be used as step-by-step instructions for installation, and as a reference for operation, troubleshooting, and future upgrades.

WARNING: Only authorized technicians trained by Compaq should attempt to repair this equipment. All troubleshooting and repair procedures are detailed to allow only subassembly/module level repair. Because of the complexity of the individual boards and subassemblies, no one should attempt to make repairs at the component level or make modifications to any printed wiring board. Improper repairs can create a safety hazard. Any indications of component replacement or printed wiring board modifications may void any warranty.

WARNING: To reduce the risk of personal injury from electrical shock and hazardous energy levels, only authorized service technicians should attempt to repair this equipment. Improper repairs could create conditions that are hazardous.

IMPORTANT: The installation of options and servicing of this product should be performed by individuals that are knowledgeable of the procedures, precautions, and hazards associated with equipment containing hazardous energy circuits.

Text Conventions

This document uses the following conventions to distinguish elements of text:

Keys	Keys appear in boldface. A plus sign (+) between two keys indicates that they should be pressed simultaneously.
USER INPUT	User input appears in a different typeface and in uppercase.
FILENAMES	File names appear in uppercase italics.
Menu Options, Command Names, Dialog Box Names	These appear in initial capital letters.
COMMANDS, DIRECTORY NAMES, and DRIVE NAMES	These always appear in uppercase.
Type	When you are instructed *to type* information, type the information **without** pressing the **Enter** key.
Enter	When you are instructed *to enter* information, type the information and then press the **Enter** key.

Symbols in Text

These symbols may be found in the text of this guide. They have the following meanings.

WARNING: Indicates that failure to follow directions in the warning could result in bodily harm or loss of life.

CAUTION: Indicates that failure to follow directions could result in damage to equipment or loss of information.

IMPORTANT: Presents clarifying information or specific instructions.

NOTE: Presents commentary, sidelights, or interesting points of information.

Symbols on Equipment

These icons may be located on equipment in areas where hazardous conditions may exist.

Any surface or area of the equipment marked with these symbols indicates the presence of electrical shock hazards. Enclosed area contains no operator serviceable parts.

WARNING: To reduce risk of injury from electrical shock hazards, do not open this enclosure.

Any RJ-45 receptacle marked with these symbols indicates a Network Interface Connection.

WARNING: To reduce risk of electrical shock, fire, or damage to the equipment, do not plug telephone or telecommunications connectors into this receptacle.

Any surface or area of the equipment marked with these symbols indicates the presence of a hot surface or hot component. If this surface is contacted, the potential for injury exists.

WARNING: To reduce the risk of injury from a hot component, allow the surface to cool before touching.

Where to Go for Additional Help

Major sources of additional information are listed below.

Other Information Sources

In addition to this guide, the following information sources are available:

- User Documentation
- *Compaq Service Quick Reference Guide*
- Service Training Guides
- Compaq Service Advisories and Bulletins
- Compaq QuickFind
- Compaq Insight Manager
- Compaq Download Facility: Call 1-281-518-1418.

Telephone Numbers

For the name of your nearest Compaq Authorized Reseller:

In the United States, call 1-800-345-1518.

In Canada, call 1-800-263-5868.

For Compaq technical support:

In the United States and Canada, call 1-800-OK-COMPAQ (For continuous quality improvement, calls may be recorded or monitored.)

For Compaq technical support phone numbers outside the United States and Canada, visit the Compaq website at:

www.compaq.com

Chapter 1
Illustrated Parts Catalog

This chapter provides an illustrated parts breakdown and a reference for spare parts for the Compaq Professional Workstation AP500.

Mechanical Parts

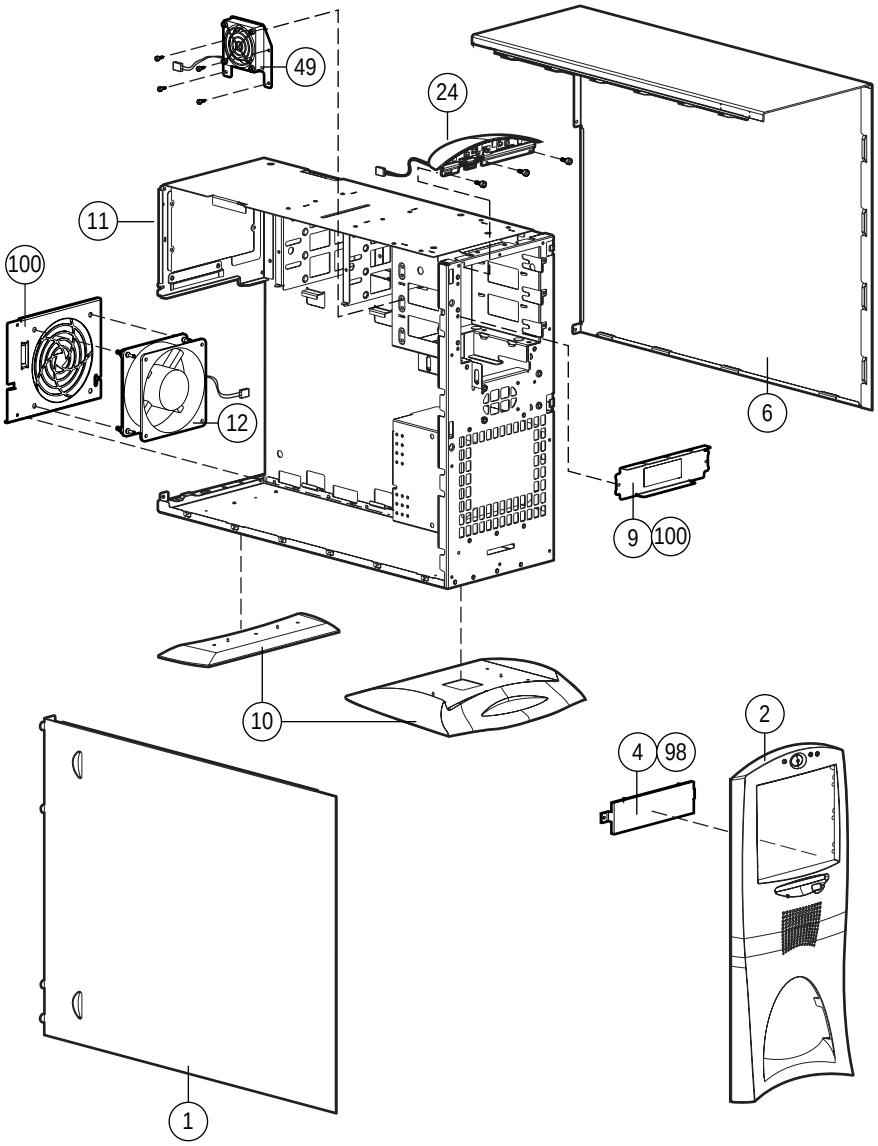


Figure 1-1. Exploded view of the Compaq Professional Workstation AP500 mechanical parts

System Components

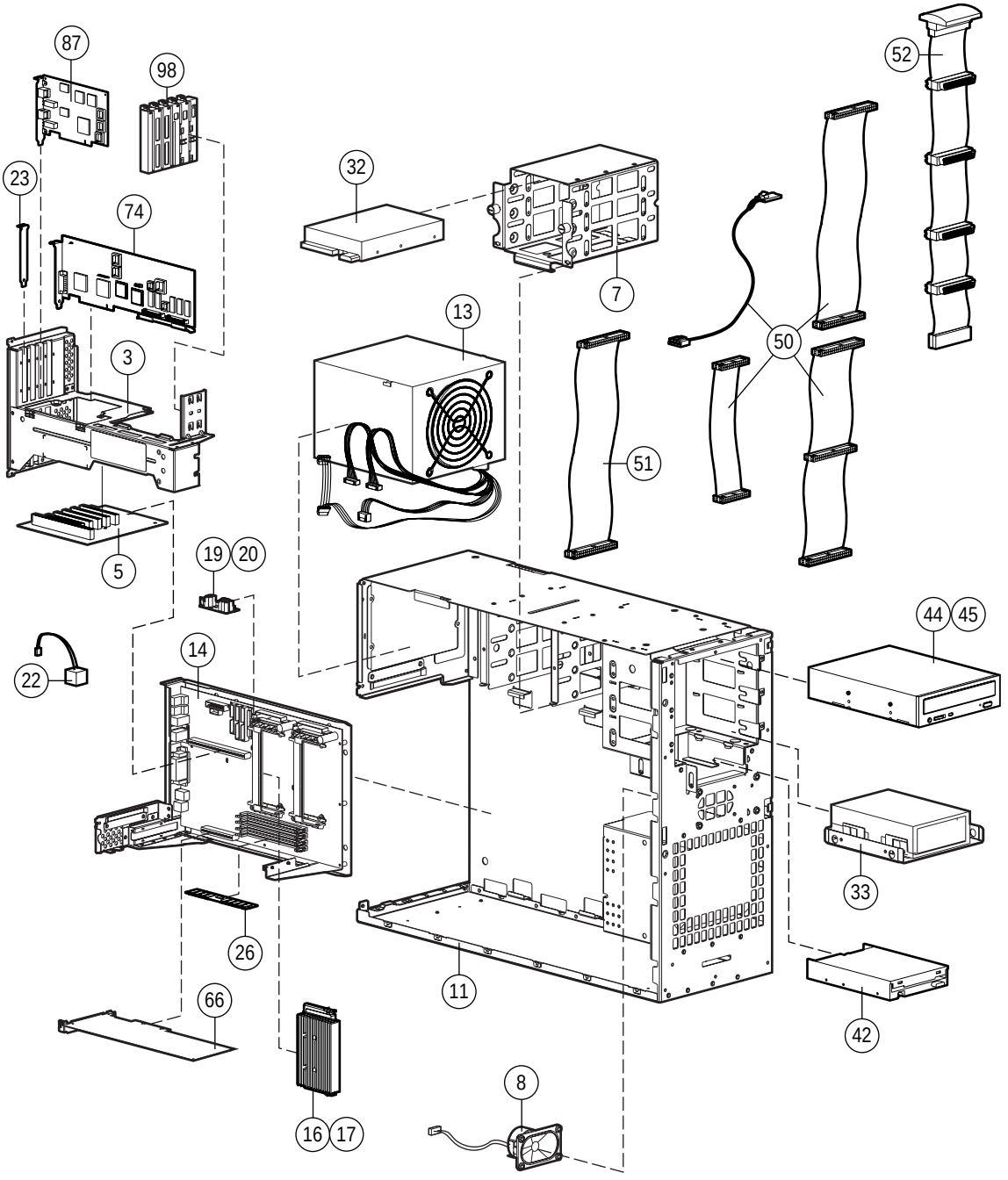


Figure 1-2. Exploded view of the Compaq Professional Workstation AP500 system components

Spares Parts List

Parts or components marked with an asterisk (*) are *not* illustrated.

Table 1-1
Compaq Professional Workstation AP500
Spares Parts List

Reference	Description	Spares Part #
MECHANICAL		
1	Side Access Panel	329263-001
2	Front Bezel	338549-001
3	I/O Bracket (Expansion Board Assembly)	338563-001
4	Blank Drive Bezel (part of the Miscellaneous Plastic Kit)	329265-001
5	Backplane Board	338513-001
6	Hood	338565-001
7	Removable Hard Drive Cage	338557-001
8	Speaker	328730-001
9	EMI/Cooling Shield (part of the Miscellaneous Hardware Kit)	338559-001
10	Workstation Feet	329264-001
11	Chassis	338547-001
SYSTEM		
12	System Fan (fan bracket included in Miscellaneous Hardware Kit)	338558-001
13	Power Supply, 325W	328563-001
14	System Board with Tray 400-, 450-, 500-MHz	402124-001
15	System Board with Tray 400-, 450-MHz	338548-001*
16	Intel Pentium II Processor, 400/100 MHz, 512K with heatsink	327648-001
17	Intel Pentium II Processor, 450/100 MHz, 512K with heatsink	328785-001
18	Intel Pentium III Processor, 500/100 Mhz, 512K with heatsink	116402-001*
19	Processor Power Module (Voltage Regulator Module) For 350/400/450/500 MHz CPU	329267-001
20	Processor Power Module (Voltage Regulator Module) For 350/400/450 MHz CPU	327660-001
21	Lock Security Bracket	199109-001*

Continued

Compaq Professional Workstation AP500 Spares Parts List *Continued*

Reference	Description	Spares Part #
22	External Battery	160274-001
23	Expansion Board Slot Cover	141081-001
24	Power Switch and LEDs with Cable	329270-001
MEMORY		
25	32-MB Memory Module (Registered 100-MHz SDRAM)	317747-001*
26	64-MB Memory Module (Registered 100-MHz SDRAM)	317745-001
27	128-MB Memory Module (Registered 100-MHz SDRAM)	317756-001*
28	256-MB Memory Module (Registered 100-MHz SDRAM)	317749-001*
MASS STORAGE		
29	4.3-GB Wide Ultra2 SCSI Hard Drive 7200 rpm	349533-001*
30	4.3-GB Wide Ultra2 SCSI Hard Drive 10,000 rpm	386538-001*
31	9.1-GB Wide Ultra2 SCSI Hard Drive 7200 rpm	349534-001*
32	9.1-GB Wide Ultra2 SCSI Hard Drive 10,000 rpm	386539-001
33	18-GB Wide Ultra2 SCSI Hard Drive 10,000 rpm	386540-001
34	4.3-GB Wide-Ultra SCSI Hard Drive, 7200 rpm	339514-001*
35	4.3-GB Wide-Ultra SCSI Hard Drive, 10,000 rpm	336383-001* 386539-001*
36	9.1-GB Wide-Ultra SCSI Hard Drive 7200 rpm	339515-001*
37	9.1-GB Wide-Ultra SCSI Hard Drive 10,000 rpm	336384-001*
38	18-GB Wide-Ultra SCSI Hard Drive 10,000 rpm	336385-001*
39	6.4-GB Ultra ATA Hard Drive	166973-001*
40	10-GB Ultra ATA Hard Drive, 7200 rpm	330520-001*
41	Symbios Wide Ultra2 PCI SCSI Controller	114009-001*
42	1.44-MB Diskette Drive	179161-001
43	100-MB Zip Drive	401624-001*
44	32X Max CD-ROM Drive (IDE)	327659-001
45	DVD-ROM Drive	105771-001
46	12/24-GB DAT Drive	340593-001*

Continued

Compaq Professional Workstation AP500 Spares Parts List *Continued*

Reference	Description	Spares Part #
47	4/8-GB SLR Drive	340591-001*
48	Hard Drive Mounting Bracket (Bays 5 and 6)	243231-001*
49	Fan and Cable for >7200 rpm Hard Drives Installed in Bay 5 or 6	329266-001
CABLE KITS		
50	Miscellaneous Signal Cable Kit (CD-ROM Drive, HD, Diskette, Audio)	327649-001
51	SCSI cable, wide	338546-001
52	Wide Ultra2 SCSI cable	402222-001
53	SCSI adapter, 50- to 68-Pin (internal)	189638-001*
KEYBOARD AND MOUSE		
54	Keyboard	269513-001*
55	3-Button Mouse	327716-001*
MONITOR		
56	P75 Monitor	307815-xxx*
57	V75 Monitor	307713-xxx*
58	V90 Color Monitor	305602-xxx*
59	P900 Color Monitor	303502-xxx*
60	P1610 Monitor	305710-xxx*
61	P110 Monitor	284959-xxx*
62	TFT 5000:	
	Opal, TS, NA, TC099	115714-001*
	Carbon, TS, NA, TC099	115712-001*
63	TFT 8000:	
	Opal, no protective panel, TC095, WW	307911-001*
	Opal, with protective panel, TC095, WW	102358-B24*
	Carbon, no protective panel, TC095, WW	102359-B24*
	Carbon, with protective panel, TC095, WW	102356-B24*
64	TFT 450: *Order TFT 450 spare part from the TFT 450 guide (PN 170431-001)**	
65	TFT 500: *Order TFT 500 spare part from the TFT 500 guide (PN 285012-001)**	

Continued

Compaq Professional Workstation AP500 Spares Parts List *Continued*

Reference	Description	Spares Part #
GRAPHICS		
66	GLoria Synergy+ Graphics Controller 4-MB (AGP)	327599-001
67	GLoria Synergy+ 4-MB Memory Upgrade	327600-001*
68	GLoria Synergy+ 8 MB (PCI) Graphics Controller	298796-001*
69	PowerStorm 300 Graphics Controller (AGP)	338539-001*
70	Matrox Millennium G200 Graphics Controller	294409-001*
71	Matrox Millennium G200 8-MB Memory Upgrade	386047-001*
72	Matrox Productiva G100 Multi-Monitor Series Graphics Controller	101239-001*
CONTROLLERS		
73	Compaq SMART-2SL Array Controller	242777-001*
74	Dual-Channel SCSI Controller	295626-001*
COMMUNICATIONS		
75	Netelligent 16/4 TR PCI IBM UTP/STP Controller	301210-001*
76	Netelligent 16/4 TR PCI UTP/STP Controller	268010-001*
77	Netelligent 10 T/2 PCI UTP/Coax Controller	292857-001*
78	Netelligent 10 T/2 ISA UTP/Coax Controller	265618-001*
79	Netelligent 100 FDDI PCI SAS Fiber-SC	242506-002*
80	Netelligent 100 FDDI PCI DAS Fiber-UTP	242506-003*
81	Netelligent 100 FDDI PCI SAS Fiber-UTP	242506-004*
82	Netelligent 100 FDDI PCI SAS Fiber-MIC	242506-005*
83	Netelligent 56K PCI Fax Modem	321510-B21*
84	Netelligent 56K ISA Fax Modem	294912-001*
85	Compaq Fast Ethernet NIC NC3122	317453-001*
86	Compaq Fast Ethernet NIC NC3120	317606-001*
87	Compaq Ethernet NIC NC1120	317358-001
88	Compaq Fast Ethernet NIC NC3161	323556-001*

Continued

Compaq Professional Workstation AP500 Spares Parts List *Continued*

Reference	Description	Spares Part #
SOFTWARE		
89	Magellan Driver CD	297863-001*
90	Spaceball Driver CD	298033-001*
91	Microsoft Windows NT Workstation 4.0 CD	275573-xxx*
92	Compaq SmartStart for Workstations CD	275574-xx3/xx2(SP)*
93	Systems ROMPaq	275595-001*
94	Compaq Setup and Compaq Diagnostics for Workstations Diskette	275575-xxx*
MISCELLANEOUS		
95	Magellan 3D Pointing Device (spacemouse)	297645-001*
96	Spaceball 3D Pointing Device	297644-001*
97	Compaq Multimedia Sound System (US)	294122-xxx*
98	Miscellaneous Plastic Kit (includes baffles*, card guide and blank drive bezel)	329265-001
99	Heatsink Bridge	327658-001*
100	Miscellaneous Hardware Kit (includes EMI/Cooling Shield and System Fan Bracket)	338559-001
101	Rack Mounting Kit	338556-001*
102	Shipping Box with Buns (US)	329268-001*
103	Shipping Box with Buns (INTL)	329268-002*
104	SCSI Adapter, 68- to 50-Pin (external)	270229-001*
DOCUMENTATION		
105	Maintenance and Service Guide	338561-001*
106	Illustrated Parts Map	338560-001*
107	Service Quick Reference Guide (revision -038 or later)	162212-001*

Chapter 2
Service Preliminaries

This chapter identifies the following service considerations:

- Preliminary warnings and cautions
- Electrostatic discharge information
- Equipment symbols
- Tools and software requirements
- Warranty information

IMPORTANT: Adherence to the procedures and precautions described in this chapter is essential for proper service.

Compaq Technician Notes

WARNING: To reduce the risk of personal injury from electrical shock and hazardous energy levels, do not exceed the level of repair specified in these procedures. Because of the complexity of the individual boards and subassemblies, do not attempt to make repairs at the component level or make modifications to any printed wiring board. Improper repairs could create conditions that are hazardous.

WARNING: To reduce the risk of electric shock or damage to the equipment:

Disconnect power from the computer by unplugging the power cord from either the electrical outlet or the computer.

Do not disable the power cord grounding plug. The grounding plug is an important safety feature.

Plug the AC adapter or power cord into a grounded (earthed) electrical outlet that is easily accessible at all times.

CAUTION: To properly ventilate the system, you must provide at least 6 inches (15 cm) of clearance at the front of the workstation and 3 inches (7.6 cm) at the back.

IMPORTANT: Any indication of repair at the component level or modification of a printed wiring board may void any warranty.

Preliminary Warnings and Cautions

The following should be noted when operating or servicing the Compaq Professional Workstation AP500:

WARNING: To reduce the risk of electric shock or damage to the equipment:

- Disconnect power from the system by unplugging all power cords from either the electrical outlet or the Compaq Professional Workstation AP500.
- Do not disable the power cord grounding plug. The ground plug is an important safety feature.
- Plug the power cord into a grounded (earthed) electrical outlet that is easily accessible at all times.

WARNING: To reduce the risk of personal injury from hazardous energy levels, only authorized service technicians should attempt to repair this equipment. Because of the complexity of the individual boards and subassemblies, no one should attempt to make repairs at the component level or to make modifications to any printed wiring board. Improper repairs can create a safety hazard.

CAUTION: The power supply in the Compaq Professional Workstation AP500 has an auxiliary power section. This section is always active as long as the unit is plugged into a live AC outlet. Be sure to turn off the switch and unplug the power cord before performing any service work.

CAUTION: To properly ventilate the system, you must provide at least 6 inches (15 cm) of clearance at the front of the workstation and 3 inches (7.6 cm) at the back.

IMPORTANT: Any indications of component replacement or printed wiring board modifications may void any warranty.

Electrostatic Discharge Information

A discharge of static electricity can damage static-sensitive devices or micro-circuitry. Proper packaging and grounding techniques are necessary precautions to prevent damage. To prevent electrostatic damage, observe the following precautions:

- Transport products in static-safe containers (conductive tubes, bags, or boxes).
- Keep electrostatic-sensitive parts in their containers until they arrive at static-free stations.
- Cover workstations with approved static-dissipating material. Provide a wrist strap connected to the work surface and properly grounded tools and equipment.
- Keep work area free of non-conductive materials such as ordinary plastic assembly aids and foam packing.
- Be sure you are always properly grounded when touching a static-sensitive component or assembly.
- Avoid touching pins, leads, or circuitry.
- Always place drives PCB assembly-side down.
- Use conductive field service tools.

Equipment Symbols

The following symbols are located on applicable components of the workstation and should be observed when servicing the workstation to avoid personal injury or damage to the components:

WARNING: Any surface or area of the equipment marked with these symbols indicates the presence of a hot surface or hot component. If this surface is contacted, the potential for injury exists. To reduce risk of injury from a hot component, allow the surface to cool before touching.

WARNING: Any surface or area of the equipment marked with these symbols indicates the presence of electrical shock hazards. Enclosed area contains no operator serviceable parts. To reduce risk of injury from electrical shock hazards, do not open this enclosure.

WARNING: Any RJ-45 receptacle marked with these symbols indicates a Network Interface Connection. To reduce risk of electrical shock, fire, or damage to the equipment, do not plug telephone or telecommunications connectors into this receptacle.

Tools and Software Requirements

To service the workstation, you might need:

- Torx T-10 screwdriver
- Torx T-15 screwdriver
- Flat-blade screwdriver
- Compaq Setup and Diagnostics Utility

IMPORTANT: Prior to servicing the workstation, be sure the drivers from the latest Compaq Workstation SSD for Windows NT are installed. See Chapter 4 for installation procedures.

Warranty Information

The following warranties come *standard* with the workstation:

- **Standard Warranty—**a three-year limited warranty that covers three years on parts, one year on labor carry-in, and one year of onsite service
- **Pre-Failure Warranty—**a special warranty that extends the Compaq three-year limited warranty by applying it to critical system components before they fail. This warranty ensures that when you receive notification of a pre-failure condition through Compaq Insight Manager or the Windows NT Event Log, the component is replaced under warranty.

  NOTE: For more information about Compaq Insight Manager, see Chapter 4.

  The Pre-Failure Warranty covers the following workstation components:

  - SCSI hard drives
  - Error Correcting Code (ECC) memory
  - Pentium II processor
  - Pentium III Processor

In addition to the above warranties, an optional Extended Warranty is available. If purchased, this warranty extends the Standard Warranty's one year coverage for labor and onsite service for two additional years.

IMPORTANT: Observe all warnings and cautions provided herein. Failure to do so may void warranty for damaged components.

Chapter 3
Removal and Replacement Procedures

This chapter provides subassembly/module-level removal and replacement procedures for the Compaq Professional Workstation AP500.

After completing all necessary removal and replacement procedures, run the Compaq Setup and Diagnostics program to verify that all components are operating properly.

Serial Number

Provide the computer serial number to Compaq whenever you request information or order spare parts. The serial number is located on the top right side of the workstation ❶ and also on the rear of the chassis ❷.

For asset control, the serial number is also embedded in the EPROM on the system board. If the system board is replaced with a spare part from Compaq, an invalid serial number condition will be reported during POST. To clear the condition, use Compaq Softpaq SP8410. It is located at: http://www.compaq.com/support/files/workstations/us/software/674.html.

NOTE: If a system board from another workstation is installed, POST recognizes the serial number as a valid number.

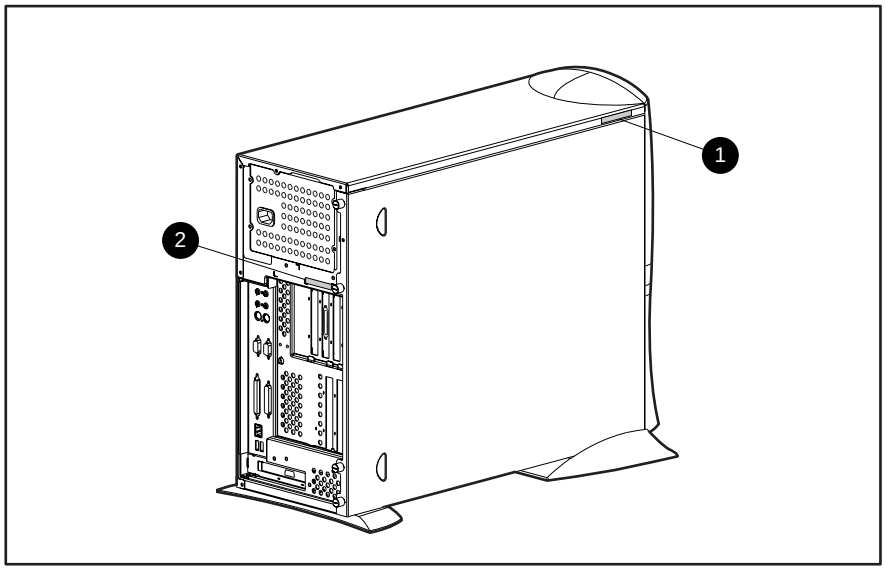


Figure 3-1. Identifying serial number locations

Service Preparations

CAUTION: The power supply in the Compaq Professional Workstation AP500 has an auxiliary power section. This section is always active as long as the unit is plugged into a live AC outlet. Be sure to turn off the switch and unplug the power cord before performing any service work.

CAUTION: Electrostatic discharge can damage electronic components. Be sure you are properly grounded before beginning any installation procedure. See "Electrostatic Discharge Information" in Chapter 2 for more information.

Before beginning any of the removal and replacement procedures, complete the following steps:

1. Turn off the workstation.
2. Disconnect the power cord from the grounded AC outlet and then from the workstation.
3. Turn off all peripheral devices and disconnect cables from the rear of the workstation.
4. Remove the cable lock in order to access internal components. See the following section for instructions on how to remove the cable lock.

Cable Lock

The workstation comes standard with a cable lock provision for attaching a padlock and/or cable lock. If installed, the locks must be removed before accessing internal components.

To remove the lock:

1. Unlock and remove the cable lock and/or the padlock ❶.
2. Remove the security bracket (plate) seated over the cable lock bracket ❷.
3. Unfasten the retaining screw to release the cable lock bracket ❸.

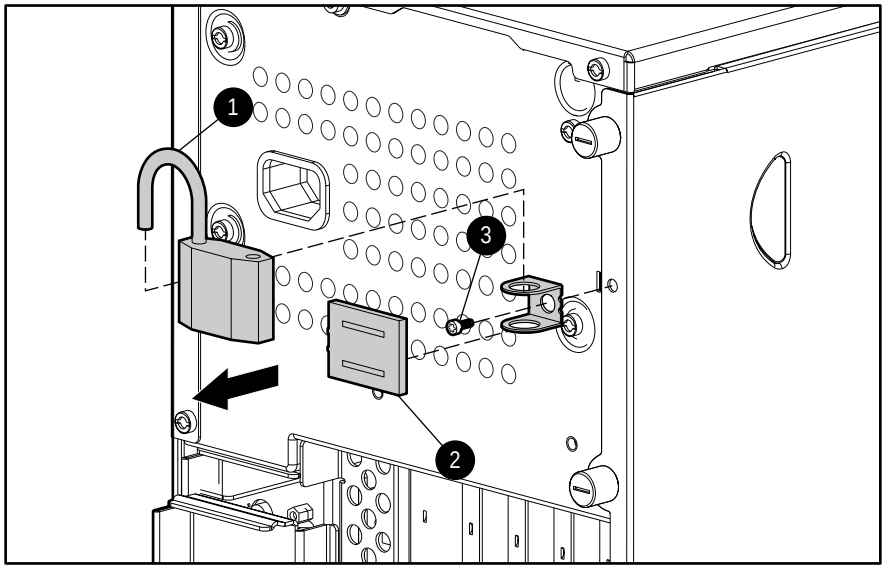


Figure 3-2. Removing the padlock

NOTE: In some of the removal procedures in this chapter, you will be asked to remove the workstation feet and lay the workstation on its side when servicing some of the internal components.

NOTE: For more information on preparing the workstation for service, see Chapter 2.

Workstation Feet

NOTE: Not all procedures in this chapter require the removal of the workstation feet. Be sure to thoroughly read each removal and replacement procedure before attempting to access the workstation's internal components**.**

To remove the workstation feet:

1. Perform the service preparations shown on page 3-2, then lay the workstation on its side.
2. Remove the screws that secure the feet.
3. Remove the feet.

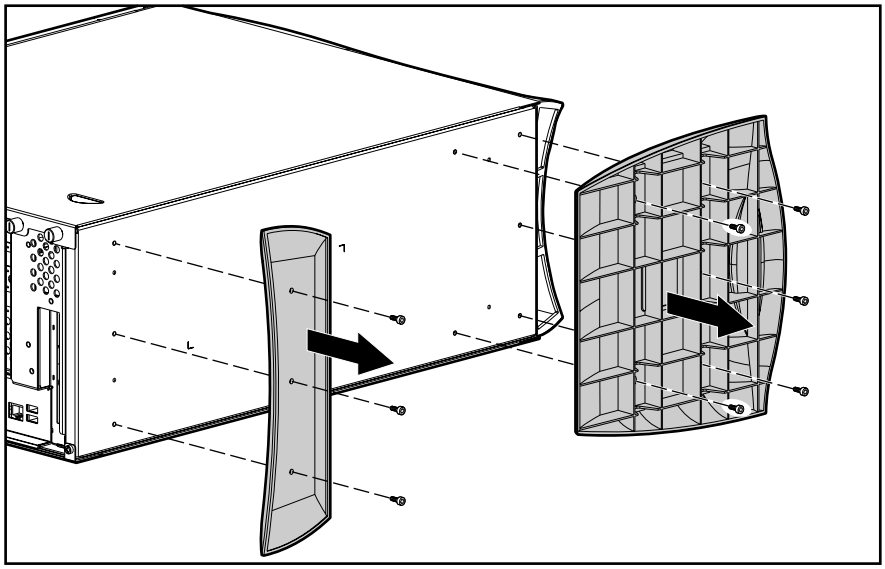


Figure 3-3. Removing the workstation feet

4. To replace the feet, reverse the above procedure.

IMPORTANT: Compaq recommends that you perform certain removal and replacement procedures with the workstation laying on its side. Refer to each procedure for instructions.

Side Access Panel

CAUTION: Do not operate the workstation with the side access panel removed. The panel is an integral part of the cooling system; removing it while the system is operating may adversely affect data integrity.

To remove the side access panel:

1. Perform the service preparations shown on page 3-2.
2. Loosen the four rear panel thumbscrews, then slide the side access off.

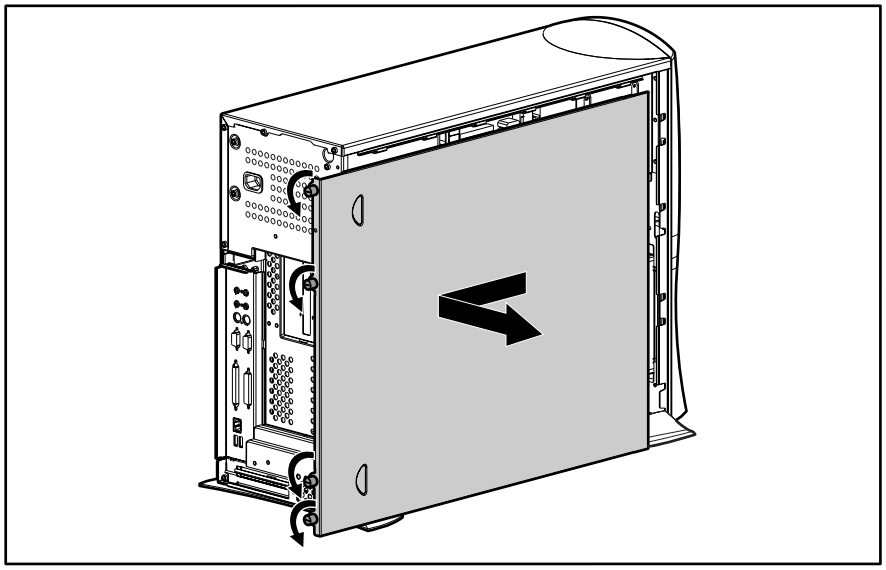


Figure 3-4. Loosening the thumbscrews and removing the side access panel

WARNING: To reduce the risk of personal injury from hot surfaces, allow the internal system components to cool before touching.

IMPORTANT: When replacing the side access panel, be sure to tighten all four thumbscrews.

NOTE: The hood label attached to the inside of the side access panel provides system configurations and the installation of additional components.

To replace the side access panel:

1. Be sure all grounding clips and EMI gaskets (shielding strips) are in place.
2. Slide the side access panel in at an angle on one side, drop it into place, then slide it into the unit completely.
3. Tighten the rear panel thumbscrews.

Front Bezel

To remove the front bezel:

1. Perform the service preparations shown on page 3-2.
2. Remove the side access panel.
3. Push the front bezel release latches ❶ and remove the bezel ❷.

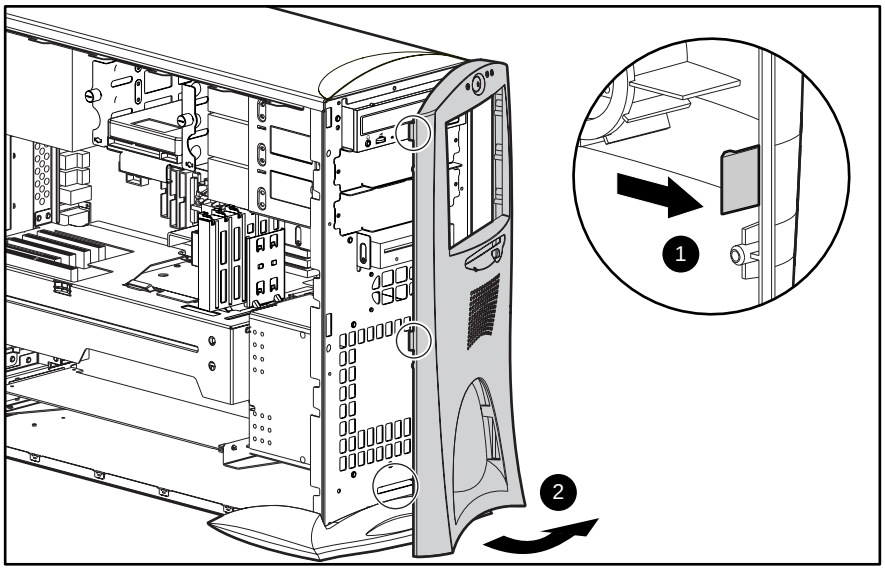


Figure 3-5. Removing the front bezel

To replace the front bezel:

1. Line up the hinges and release latches with the appropriate slots on the front of the chassis.
2. Press the bezel in to secure the release latches.

Blank Drive Bezel

To remove a blank drive bezel:

1. Perform the service preparations shown on page 3-2.
2. Remove the following components:
   - ❑ Side access panel
   - ❑ Front bezel
3. Remove the screws that secure the blank drive bezel to the front bezel.

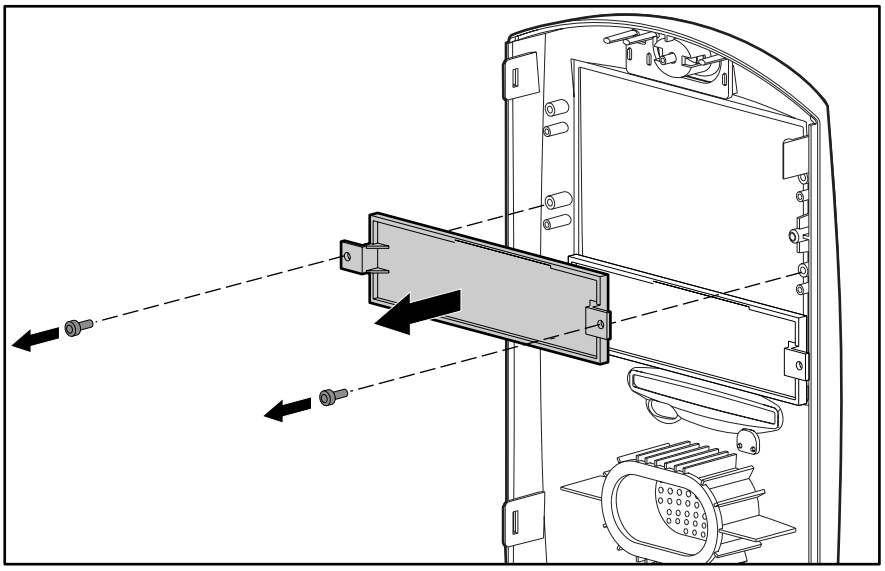


Figure 3-6. Removing a blank drive bezel

To replace a blank drive bezel, reverse the above procedure.

EMI/Cooling Shield

An EMI/cooling shield covers bays 5 and 6 to provide proper cooling and EMI protection.

To remove an EMI/cooling shield:

1. Perform the service preparations shown on page 3-2.
2. Remove the following components:
   - ❑ Side access panel
   - ❑ Front bezel
3. Remove the two screws that connect the EMI/cooling shield to the drive cage.
4. Remove the EMI/cooling shield from the drive slot.

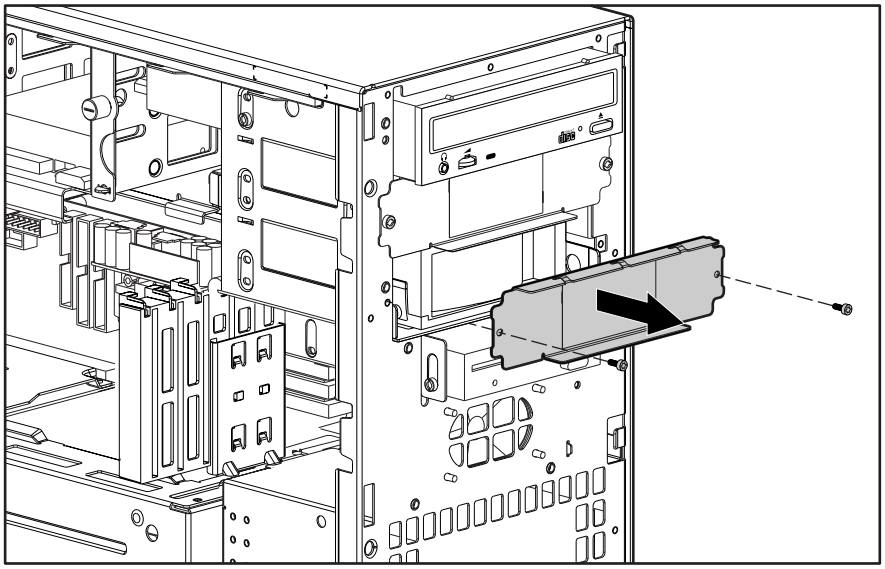


Figure 3-7. Removing the EMI/cooling shield

To replace the EMI/cooling shield, reverse the above procedure.

IMPORTANT: You must replace the shield after a hard drive is installed in the bay.

Speaker

To remove the speaker:

1. Perform the service preparations shown on page 3-2.
2. Remove the side access panel.
3. Unplug the speaker connector from the system board ❶, and remove the cable from the clip.
4. Remove the four T-15 screws securing the front of the speaker to the chassis ❷.
5. Remove the speaker from the workstation by sliding it back, then lifting it up and out of the chassis ❸.

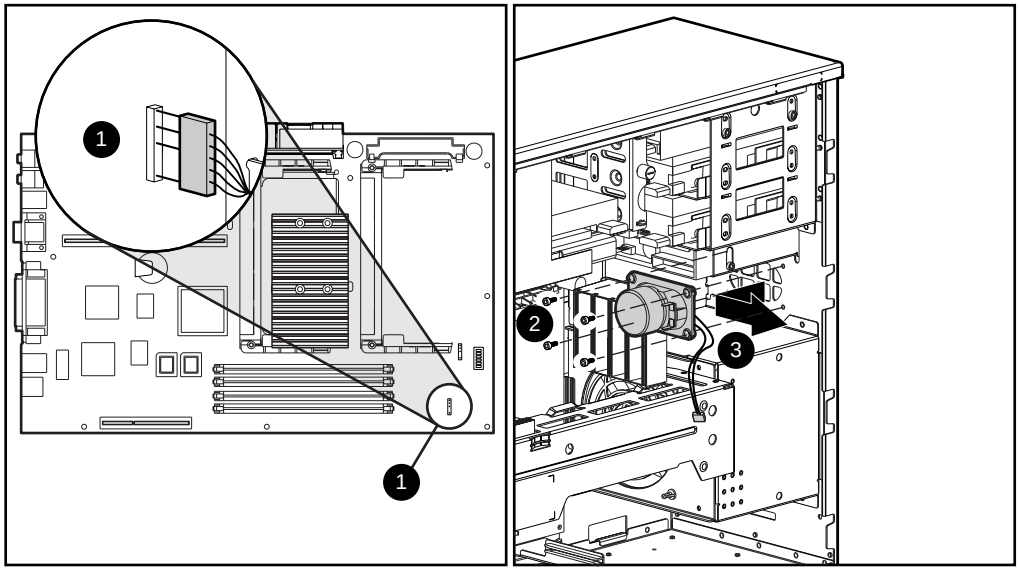


Figure 3-8. Removing the speaker

To replace the speaker, reverse the above procedure.

I/O Bracket Assembly

The I/O bracket assembly (expansion board assembly) contains a backplane board (also called a riser card), card guide, and any expansion boards. To remove the I/O bracket assembly:

1. Perform the service preparations shown on page 3-2, then lay the workstation on its side.
2. Remove the following components:
   - ❑ Workstation feet
   - ❑ Side access panel

> **CAUTION:** The power supply in the Compaq Professional Workstation AP500 contains an auxiliary power section. Be sure the power switch is off and the unit is unplugged before removing the I/O bracket assembly in the next step.

3. Grasp the I/O bracket assembly and pull it out of the chassis.

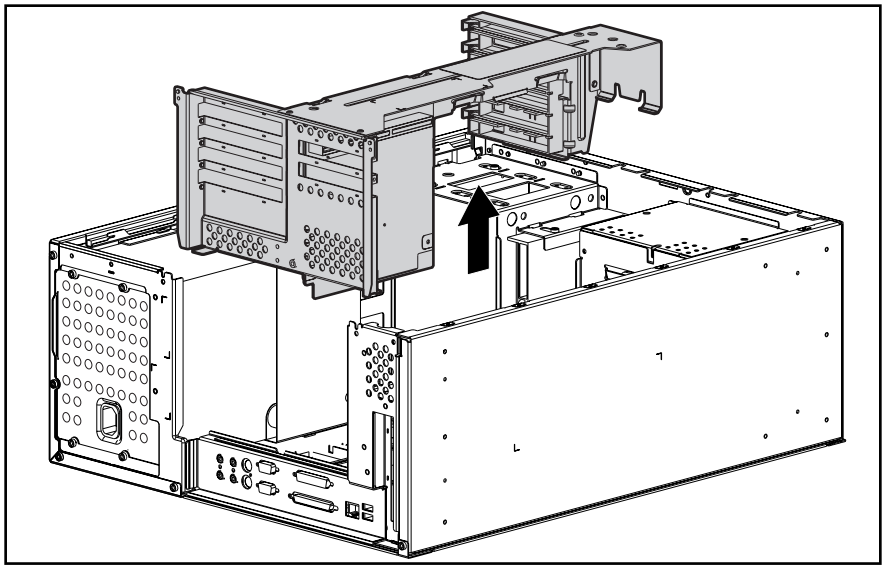


Figure 3-9. Removing the I/O bracket assembly

> **IMPORTANT:** After reconnecting the power cord to the grounded AC outlet and to the workstation, **DO NOT** turn the power button on if the Power LED is a steady amber color. A steady amber color indicates that the I/O bracket assembly is not seated properly. Disconnect the power cord and reseat the I/O bracket assembly.

Replacing the I/O Bracket Assembly

To replace the I/O bracket assembly (expansion board assembly), follow these steps:

1. Grasp the assembly and insert it into the chassis and connector on the system board. Press firmly on the I/O bracket assembly, where the backplane is connected to the system board.
2. Connect the power cord to the grounded AC outlet and to the workstation. DO NOT turn on the power switch.
3. Check if the power LED is a steady amber color. A steady amber color indicates the I/O bracket assembly, processor(s), or terminator board (if installed) is not seated properly.
4. If the power LED is a steady amber color, disconnect the power cord from the grounded AC outlet, reseat the I/O bracket assembly, processor(s), or terminator board (if installed), then reconnect the power cord.
5. Once the power LED is a steady green color, disconnect the power cord once again before continuing with additional service.

WARNING: DO NOT turn on the power switch unless the I/O bracket assembly, processor(s), and terminator board (if installed) are seated properly and the power LED is a steady green color. To reduce the risk of injury, DO NOT turn on the power until the workstation is completely reassembled.

Expansion Boards

This section discusses removal and replacement procedures for PCI or ISA expansion boards and the Accelerated Graphics Port (AGP) graphics controller.

NOTE: The following instructions also apply to installing and removing graphics controllers. For information about the installed graphics controller, refer to the appropriate guide on the SmartStart for Workstations CD under X:/DOCS/GRAPHICS, where X is the CD-ROM or DVD-ROM drive on your machine.

Identifying the PCI and ISA Expansion Slots

The Compaq Professional Workstation AP500 contains five expansion slots on the I/O bracket assembly: three PCI expansion slots, one shared PCI/ISA expansion slot, and one ISA expansion slot. The following illustration identifies the physical locations. See the corresponding table for component names.

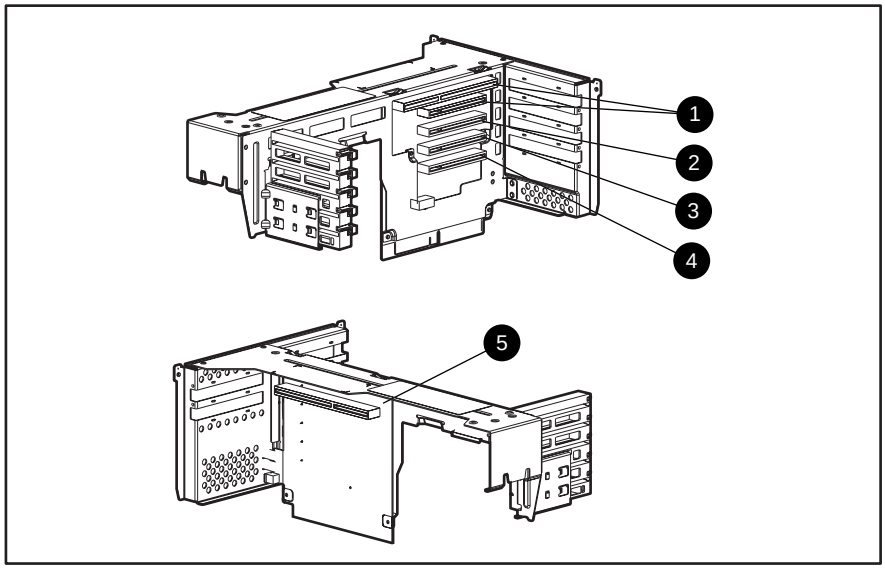


Figure 3-10. Identifying the expansion slots

Table 3-1
PCI/ISA Slots

Reference	Description
❶	PCI/ISA shared expansion slot*
❷	PCI expansion slot
❸	PCI expansion slot
❹	PCI expansion slot
❺	ISA slot

*Cannot be used simultaneously

NOTE: PCI=Peripheral Component Interconnect ISA=Industry Standard Architecture

Removing a PCI or ISA Expansion Board

NOTE: The following instructions also apply to installing and removing graphics controllers. For information about the installed graphics controller, refer to the appropriate guide on the SmartStart for Workstations CD under X:\DOCS\GRAPHICS, where X is the CD-ROM or DVD-ROM drive on your machine.

To remove a PCI or ISA expansion board:

1. Perform the service preparations shown on page 3-2, then lay the workstation on its side.
2. Remove the following components:
   - ❑ Workstation feet
   - ❑ Side access panel
   - ❑ I/O bracket assembly
3. Remove the retaining screw that holds the expansion board in place.
4. Move the tab ❶ to release the board.
5. Hold the expansion board at each end and carefully rock it back and forth until the connectors pull free from the slot. Then lift the board from the slot ❷.

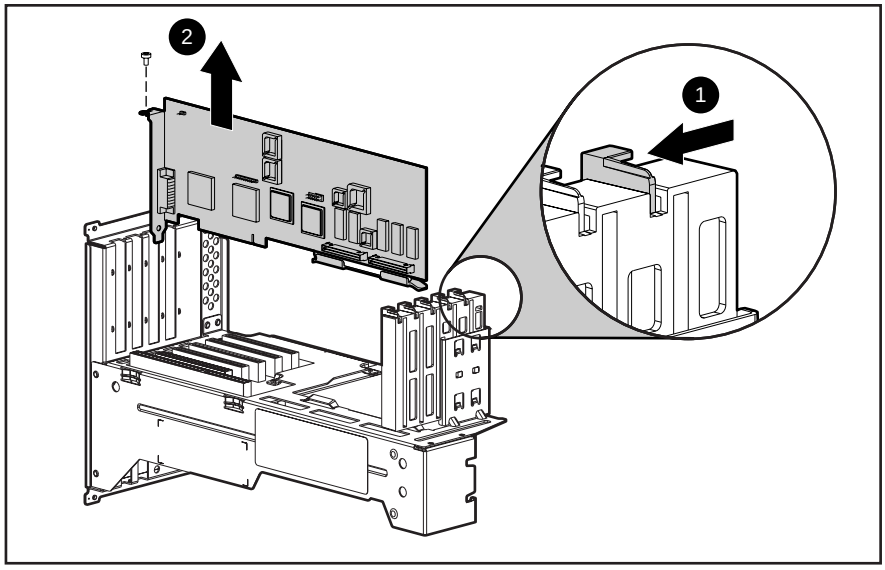


Figure 3-11. Removing an expansion board

To install an expansion board:

1. Remove the expansion slot cover.
2. Press firmly on the expansion board so that the whole connector seats properly in the expansion board slot. If you are installing a full length expansion board, be sure to engage the card guide.
3. Replace the retaining screw.

CAUTION: If you permanently remove an expansion board, install a protective slot cover to ensure proper cooling.

Removing a Symbios Wide Ultra2 PCI SCSI Controller

NOTE: For best performance, do not mix Wide-Ultra and Wide Ultra2 SCSI hard drives on the same SCSI cable or the same channel.

To remove a Wide Ultra2 SCSI Controller:

1. Perform the service preparations shown on page 3-2, then lay the workstation on its side.
2. Remove the following components:
   - ❑ Workstation feet
   - ❑ Side access panel
3. Remove the I/O bracket assembly.
4. Disconnect the SCSI cable from the controller.
5. Remove the retaining screw that holds the controller in place.
6. Remove the controller.

To replace the controller, reverse the above procedure.

Removing the Accelerated Graphics Port (AGP) Graphics Controller

The Compaq Professional Workstation AP500 comes equipped with an AGP expansion slot on the system board. The following illustration identifies the physical location of the AGP graphics controller expansion slot.

NOTE: For information about the installed graphics controller, refer to the appropriate guide on the SmartStart for Workstations CD under X:\DOCS\GRAPHICS, where X is the CD-ROM or DVD-ROM drive designation.

To remove the AGP graphics controller:

1. Remove the retaining screw that holds the controller in place.
2. Hold the controller at each end, then pull up.

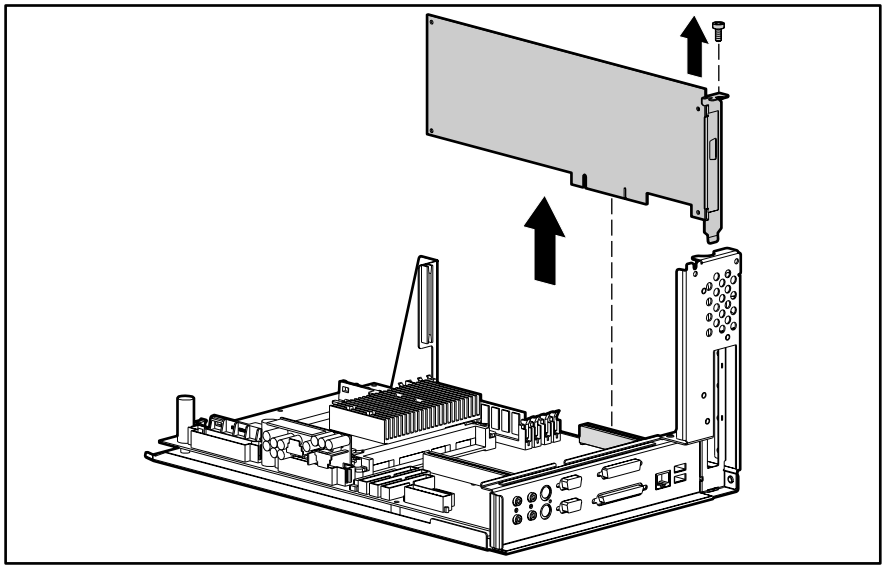


Figure 3-12. Removing an AGP graphics controller

To replace the controller, reverse the above procedure.

CAUTION: If you permanently remove an AGP graphics controller, install a protective slot cover to ensure proper cooling.

IMPORTANT: When replacing the AGP graphics controller, be sure to use AGP graphics controllers with ATX format brackets. This will ensure the controller fits properly.

IMPORTANT: When you install an AGP graphics controller, be sure to press firmly on the controller so that the whole connector seats properly in the AGP expansion slot.

Removing the Card Guide

To remove the card guide:

1. Perform the service preparations shown on page 3-2, then lay the workstation on its side.
2. Remove the following components:
   - ❑ Workstation feet
   - ❑ Side access panel
   - ❑ I/O bracket assembly
   - ❑ Full-length expansion boards, if installed
3. Using a blunt tool, press inward on the two center tabs on the card guide.
4. Gently pull the card guide out.

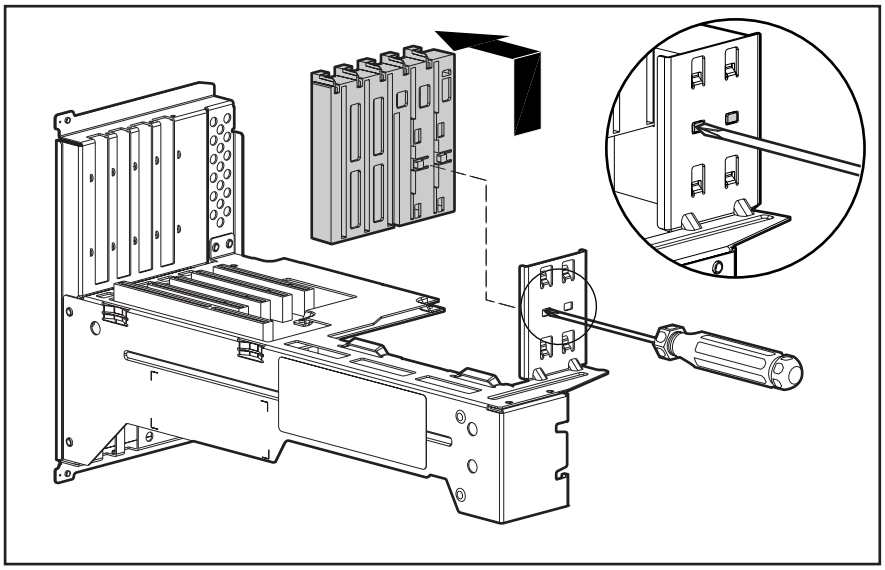


Figure 3-13. Removing the card guide

To replace the card guide, reverse the above procedure.

IMPORTANT: Before replacing the I/O bracket assembly, read "Important Guidelines for I/O Bracket Assembly Replacement" earlier in this chapter.

Removing the Backplane Board

The backplane board (also called the riser card) is attached to the I/O bracket assembly. The backplane board contains the expansion slots described and shown in the "Expansion Boards" section in this chapter.

To remove the backplane board:

1. Perform the service preparations shown on page 3-2, then lay the workstation on its side.
2. Remove the following components:
   - ❑ Workstation feet
   - ❑ Side access panel
   - ❑ I/O bracket assembly
   - ❑ Expansion boards (if installed)
   - ❑ Graphics controller (if installed)
3. Remove the four screws that secure the backplane board to the I/O bracket assembly.
4. Slide out then remove the backplane board from the I/O bracket assembly.

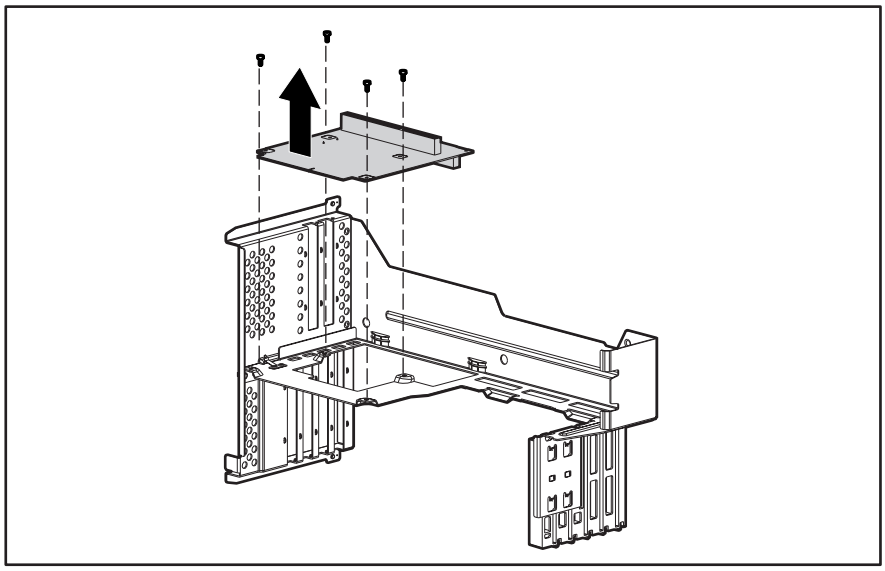


Figure 3-14. Removing the backplane board

To replace the backplane board, reverse the above procedure.

IMPORTANT: Before replacing the I/O bracket assembly, read "Important Guidelines for I/O Bracket Assembly Replacement" earlier in this chapter.

NOTE: When replacing the backplane board, align the top edge of the board with the slots in the I/O bracket assembly.

System Fan

To remove the system fan:

1. Perform the service preparations shown on page 3-2, then lay the workstation on its side.
2. Remove the following components:
   - ❑ Workstation feet
   - ❑ Side access panel
3. Disconnect the fan cable from the system board ❶.
4. Remove the two screws at the top of the fan ❷, then pull back and slide up ❸.

NOTE: If the system board has not been removed, slide it out a few inches before removing the system fan.

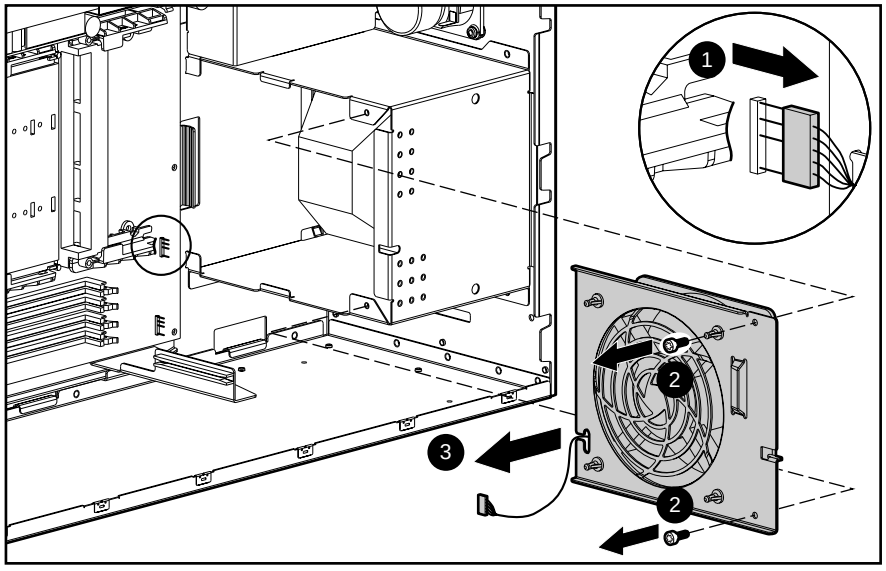


Figure 3-15. Removing the system fan

5. Pull the rubber isolators through the bracket ❶, then remove the fan from the bracket ❷.

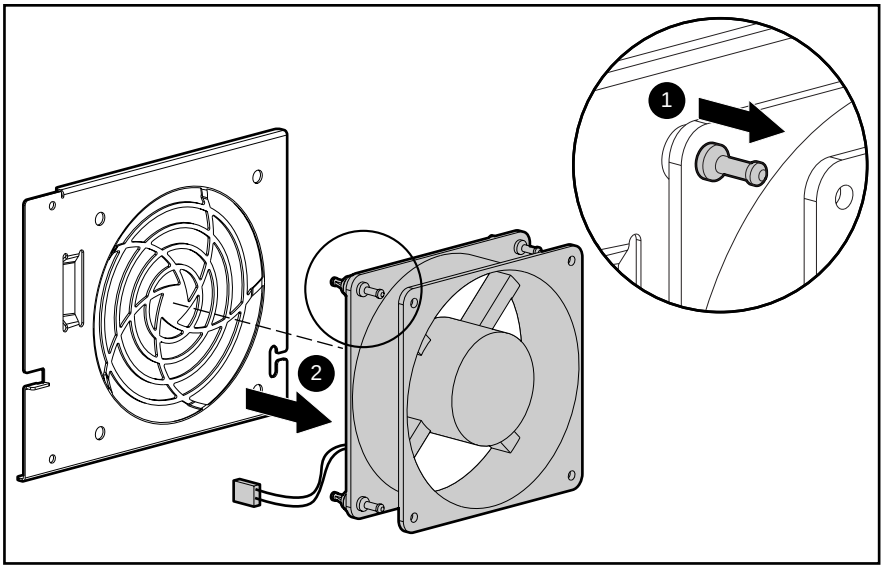


Figure 3-16. Removing the fan from the bracket

To replace the system fan, reverse the above procedure.

Mass Storage Devices

This section discusses removal and replacement procedures for the mass storage devices supported on the Compaq Professional Workstation AP500.

Drive Positions

The Compaq Professional Workstation AP500 can house up to seven mass storage devices. All models ship with a CD-ROM drive installed in Bay 4 and a diskette drive installed in Bay 7. The following illustration identifies the physical drive locations. See the corresponding table for a description of the drive bay components.

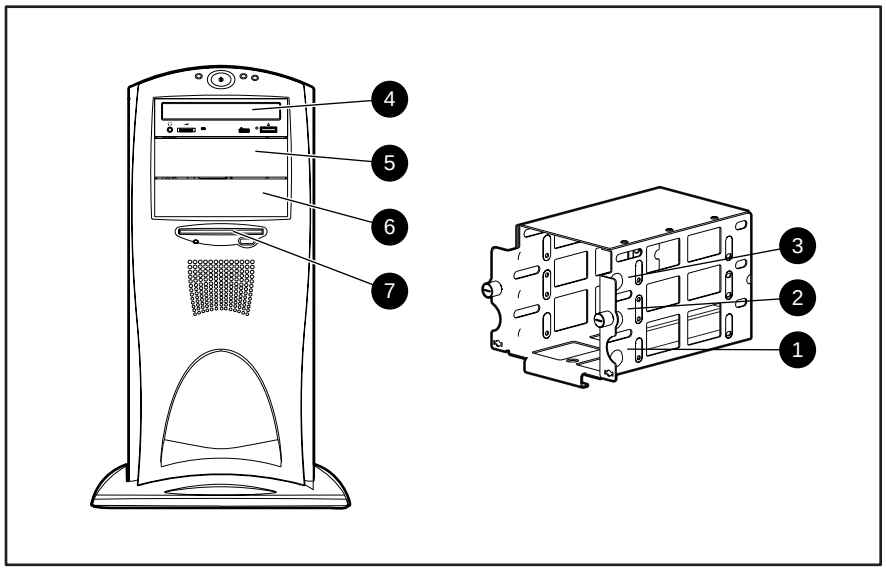


Figure 3-17. Identifying drive positions

Table 3-2
Drive Positions

Reference	Component	Description
❶	Bay 1	Part of the removable hard drive cage. A 3.5-inch, third-height bay that supports a 1.0-inch hard drive or a 1.6-inch hard drive.
❷	Bay 2	Part of the removable hard drive cage. A 3.5-inch, third-height bay that supports a 1.0-inch hard drive. Bay 2 is not available when a 1.6-inch hard drive is installed in Bay 1 or Bay 3.
❸	Bay 3	Part of the removable hard drive cage. A 3.5-inch, third-height bay that supports a 1.0-inch hard drive or a 1.6-inch hard drive.
❹	Bay 4	A CD-ROM drive is shipped in Bay 4.
❺	Bay 5*	5.25-inch, half-height bay that supports 1.0-inch or 1.6-inch storage devices. An optional hard drive, diskette drive, CD-ROM drive, DVD-ROM drive, or tape drive can be installed in Bay 5.
❻	Bay 6*	5.25-inch, half-height bay that supports 1.0-inch or 1.6-inch storage devices. An optional hard drive, diskette drive, CD-ROM drive, DVD-ROM drive, or tape drive can be installed in Bay 6.
❼	Bay 7	3.5-inch, third-height bay that supports a 1.0-inch device. A standard 3.5-inch diskette drive is shipped in Bay 7.

* An additional Zip drive can be installed in these bays.

CAUTION: If a hard drive is installed in Bay 5 or 6 or if the bays are empty, be sure that EMI/cooling shields are installed to ensure proper air flow and cooling.

IMPORTANT: Compaq recommends 10,000 rpm hard drives be installed first in Bays 1, 2, or 3. Installing a 10,000 rpm hard drive in Bays 5 or 6 will require an additional cooling fan kit.

Hardware Screws

A total of 17 extra hardware screws are provided on the side of the air plenum. The top group of eight screws ❶ is for installing hard drives in the removable hard drive cage. The bottom group of nine screws ❷ is for installing removable media storage devices in the front drive bays.

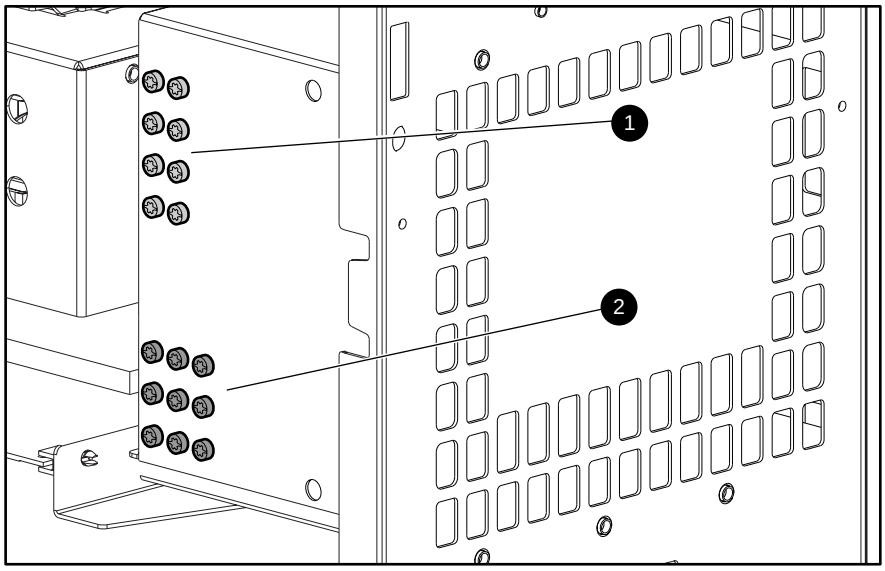


Figure 3-18. Locating the hardware screws

CD-ROM Drive or DVD-ROM Drive

To remove the CD-ROM drive or DVD-ROM drive:

1. Perform the service preparations shown on page 3-2.
2. Remove the following components:
   - ❑ Side access panel
   - ❑ Front bezel
3. Remove the retaining screws ❶ and slide the drive ❷ halfway out.
4. Disconnect the audio, data, and power cables ❸ from the back of the drive.

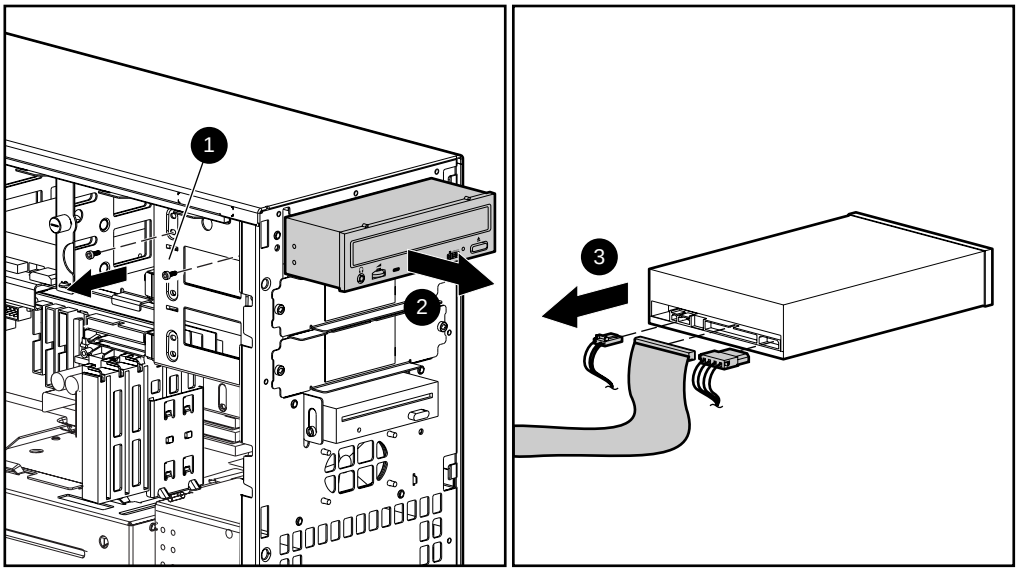


Figure 3-19. Disconnecting the cables from the back of the CD-ROM drive or DVD-ROM drive

5. Pull the drive completely out of the drive cage.

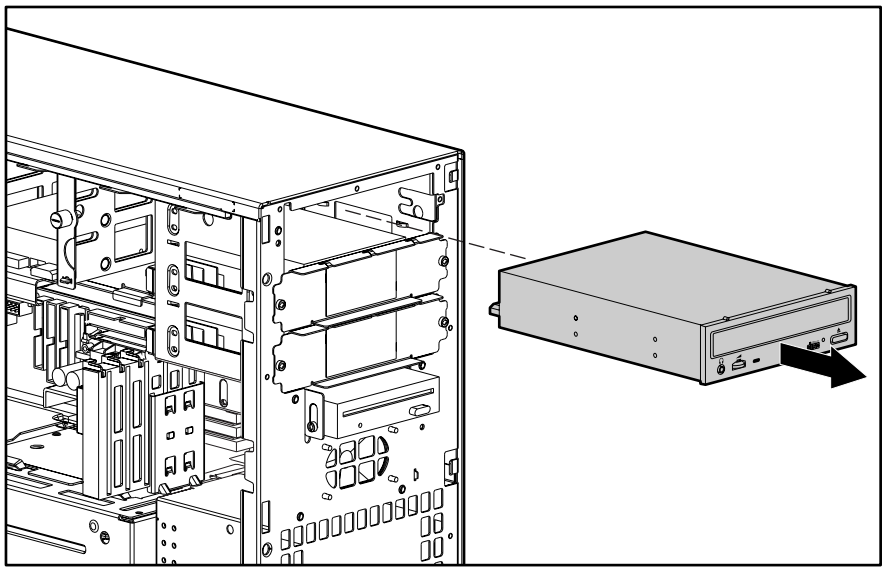


Figure 3-20. Removing the CD-ROM drive or DVD-ROM drive

To replace the drive, reverse the above procedure.

CAUTION: Use only 3/16-inch or 5 mm long screws. Using longer screws can damage the internal components of the drive.

CAUTION: When servicing the workstation, be sure cables are placed in their proper locations during the reassembly process. Improper cable placement can damage the computer.

IMPORTANT: Make sure you attach the middle connector of the data cable to the drive.

NOTE: Be sure to transfer the guide screw from the old drive to the new one. The screw is installed on the right front side of the drive. Note that extra guide screws are provided on the side of the air plenum.

Diskette Drive

IMPORTANT: Before removing the diskette drive, be sure there is no diskette in the drive.

To remove the diskette drive:

1. Perform the service preparations shown on page 3-2.
2. Remove the following components:
   - ❑ Side access panel
   - ❑ Front bezel
3. Disconnect the cables from the back of the diskette drive.

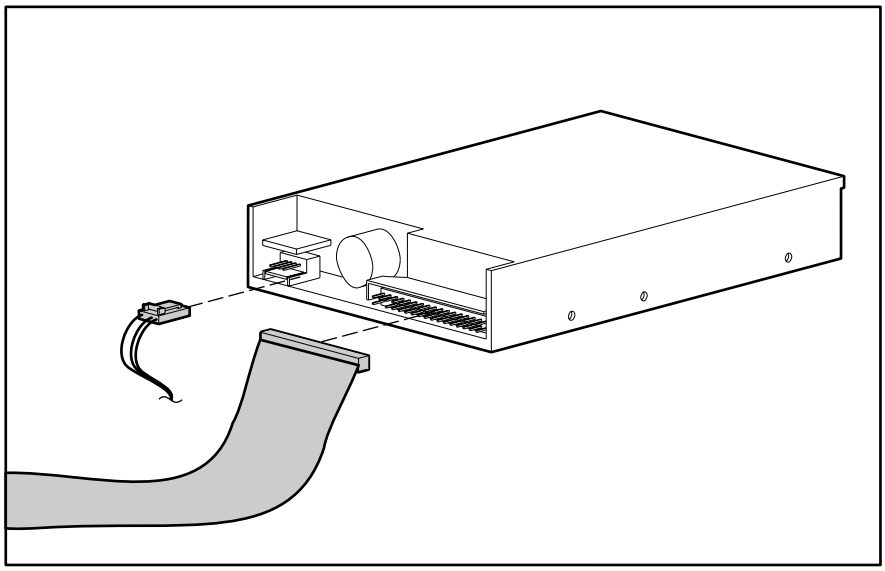


Figure 3-21. Disconnecting the cables from the back of the diskette drive

4. Remove the diskette drive retaining screws.

5. Pull the diskette drive straight out.

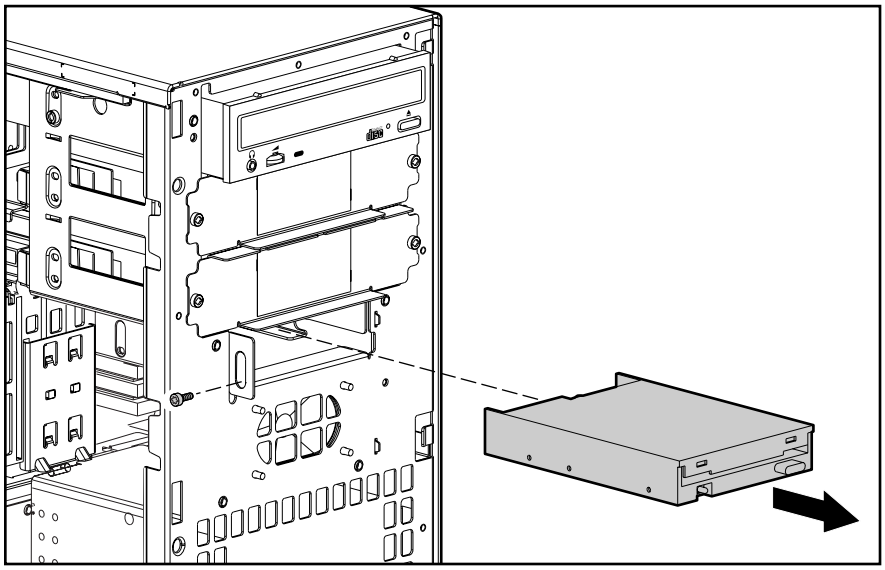


Figure 3-22. Removing the diskette drive

To replace the diskette drive, reverse the above procedure.

CAUTION: Use only 3/16-inch or 5 mm long screws. Using longer screws can damage the internal components of the drive.

CAUTION: When servicing the workstation, be sure cables are placed in their proper locations during the reassembly process. Improper cable placement can damage the computer.

NOTE: Be sure to transfer the guide screw from the old drive to the new one. The screw is installed on the right front side of the drive. Note that extra guide screws are provided on the side of the air plenum.

Removing a 7200 rpm Hard Drive from Bays 5 or 6

Drive bays 5 and 6 can be configured with either a 1.0-inch or a 1.6-inch, 7200 rpm hard drive. Other than using different screw holes, the removal of both drives a basically the same.

To remove a 7200 rpm hard drive:

1. Perform the service preparations shown on page 3-2.
2. Remove the following components:
   - ❑ Side access panel
   - ❑ Front bezel
3. Disconnect the signal and power cables.

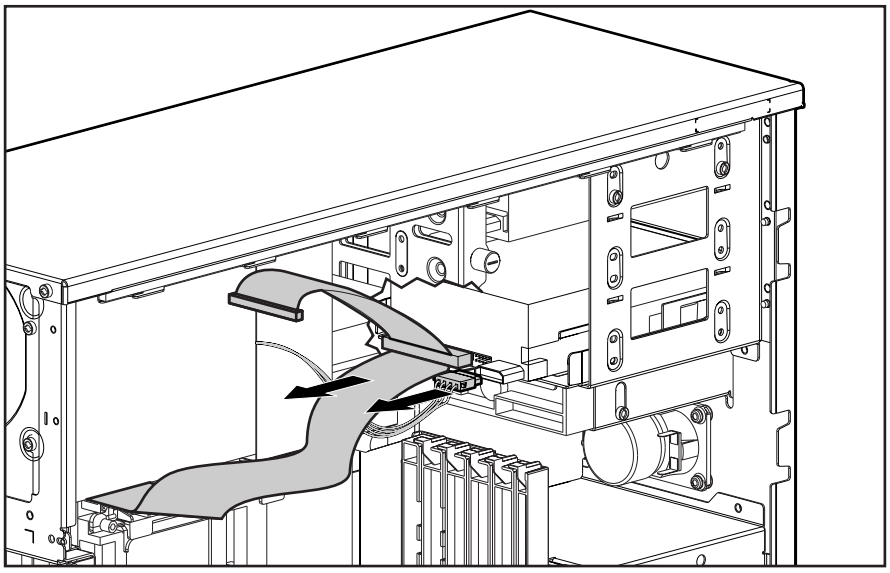


Figure 3-23. Disconnecting the cables from the hard drive

4. Remove the EMI/cooling shield.

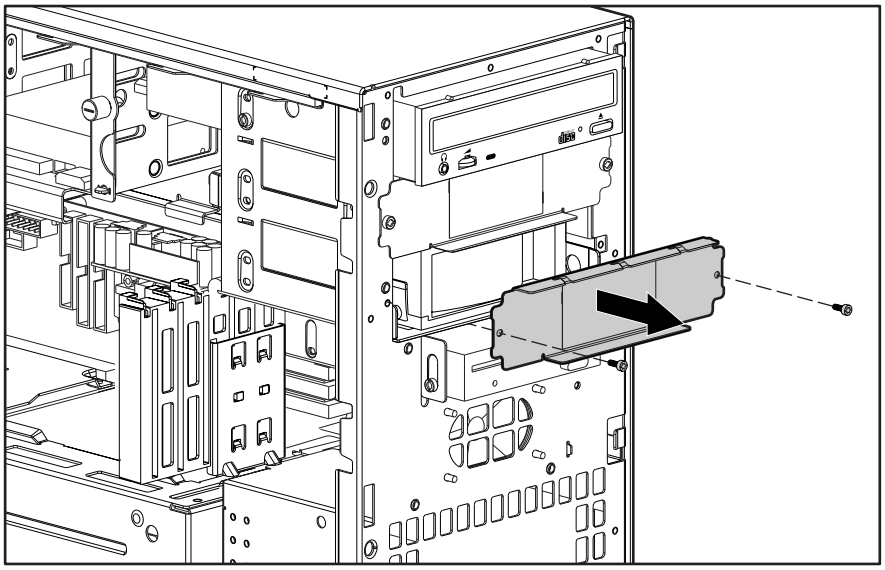


Figure 3-24. Removing the EMI/cooling shield

5. Pull the hard drive straight out.

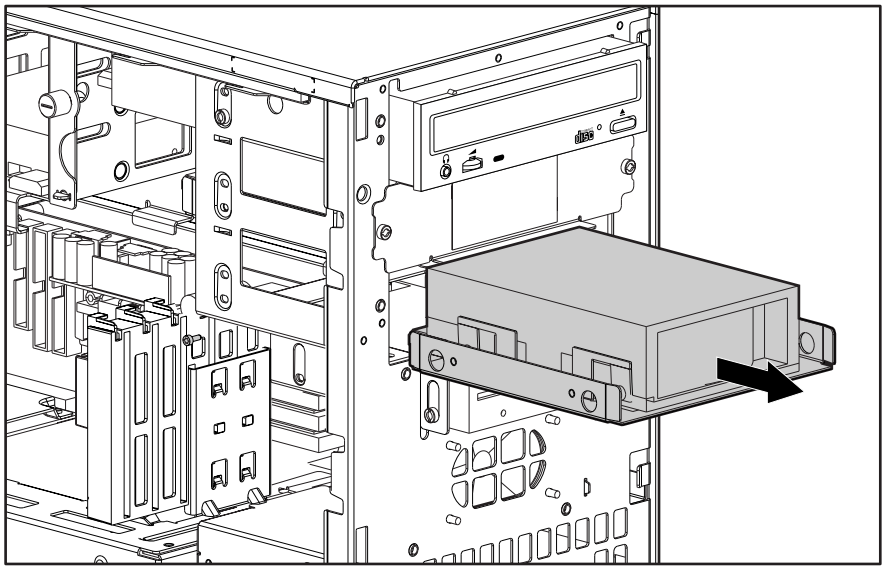


Figure 3-25. Removing the hard drive

6. Remove the retaining screws and lift the hard drive from the bracket.

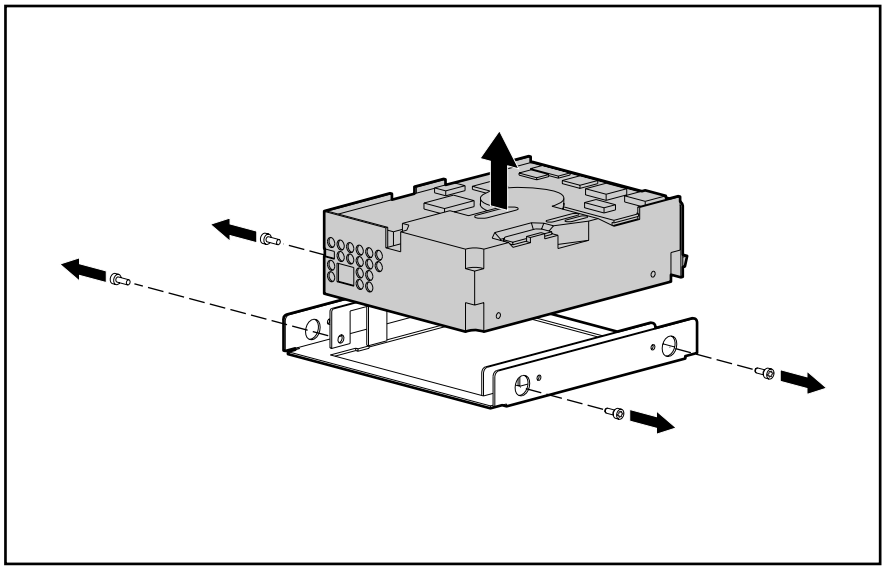


Figure 3-26. Removing a hard drive from the hard drive bracket

To reinsert a hard drive in Bays 5 or 6, reverse the above procedure.

CAUTION: Use only 3/16-inch or 5 mm long screws. Using longer screws can damage the internal components of the drive.

CAUTION: When servicing the workstation, be sure cables are placed in their proper locations during the reassembly process. Improper cable placement can damage the computer.

Removing a 10,000-rpm Hard Drive from Bays 5 or 6

Drive bays 5 and 6 can be configured with a 10,000 rpm hard drive. The removal of the drive is basically the same as removing a 7200 rpm hard drive except you will be also be removing a cooling fan. :

To remove a 10,000-rpm hard drive:

1. Perform the service preparations shown on page 3-2.
2. Remove the following components:
   - ❑ Side access panel
   - ❑ Front bezel
3. Disconnect the signal and power cables.

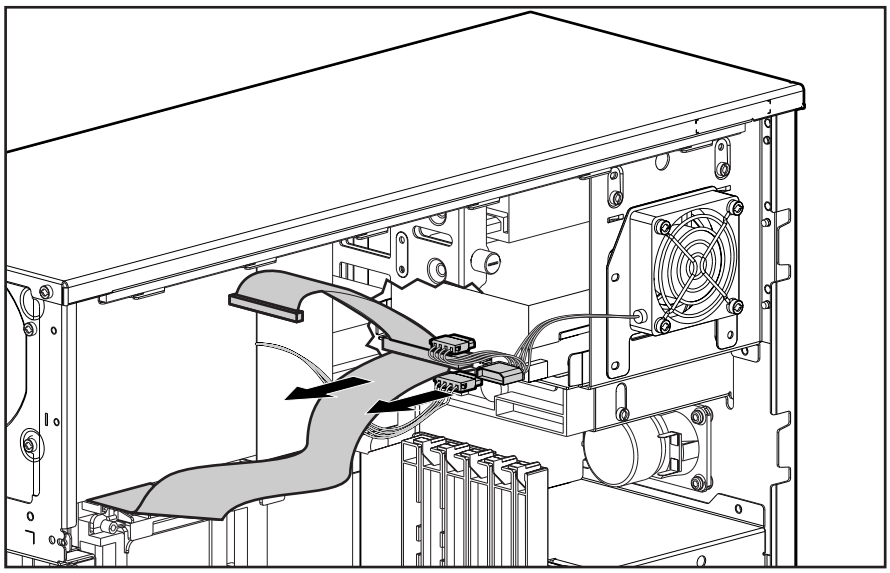


Figure 3-27. Disconnecting the cables from the hard drive

4. Disconnect the fan power cable.

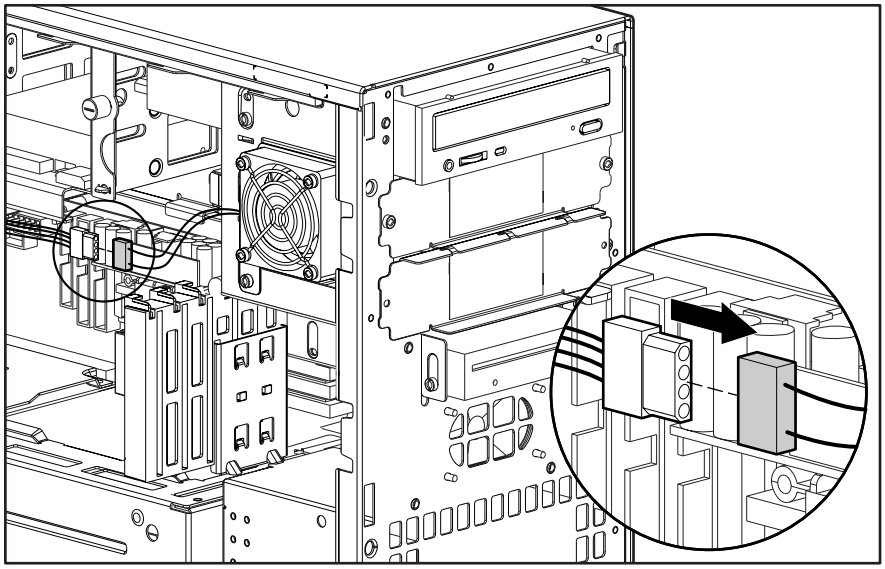


Figure 3-28. Disconnecting the fan power cable

5. Remove the retaining screws securing the fan.

NOTE: The screws that secure the fan also secure the hard drive.

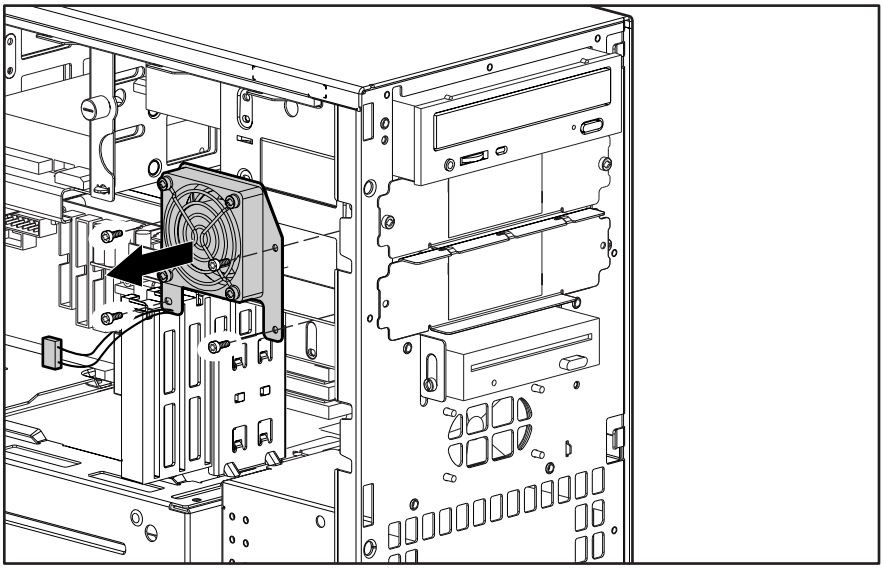


Figure 3-29. Removing the fan

6. Remove the EMI/cooling shield.

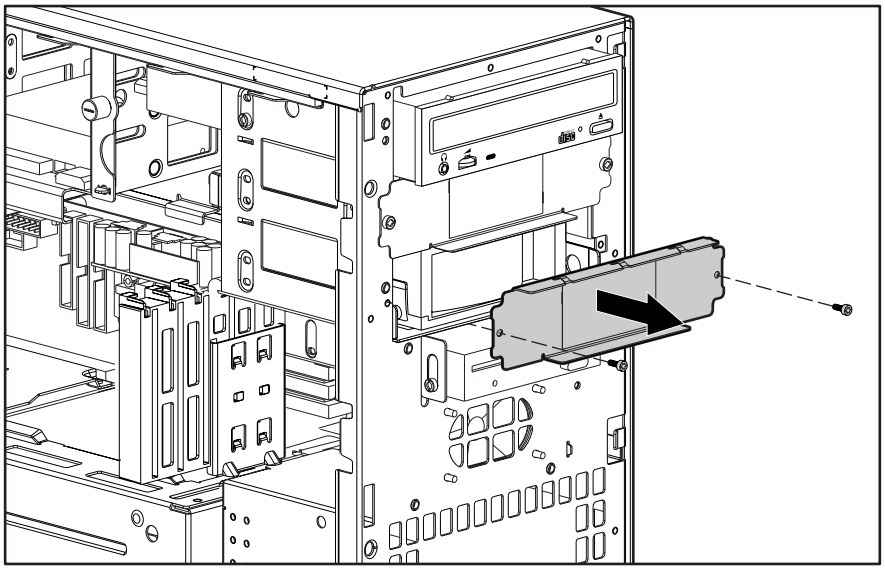


Figure 3-30. Removing the EMI/cooling shield

7. Pull the hard drive straight out.

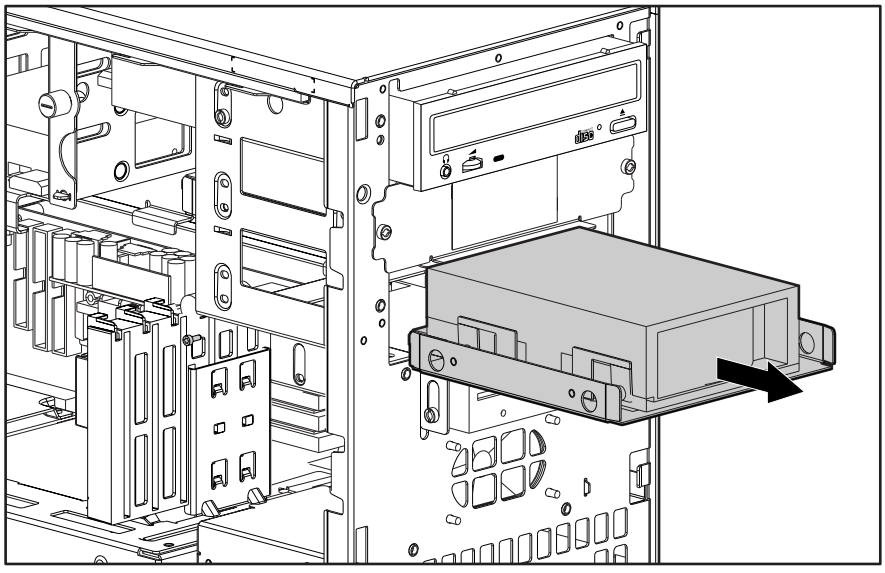


Figure 3-31. Removing the hard drive

8. Remove the retaining screws and lift the hard drive from the bracket.

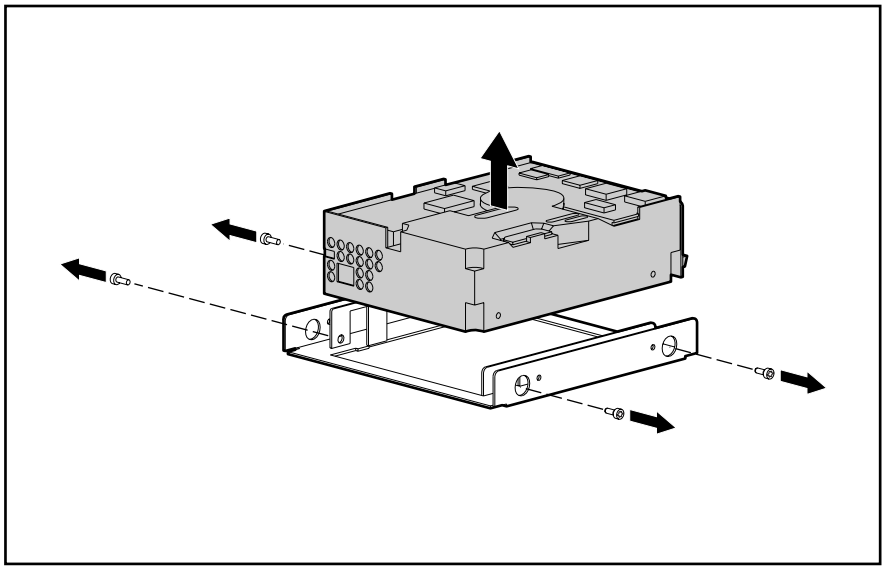


Figure 3-32. Removing a hard drive from the hard drive bracket

To reinstall a hard drive in Bays 5 or 6, reverse the above procedure.

CAUTION: Use only 3/16-inch or 5 mm long screws. Using longer screws can damage the internal components of the drive.

CAUTION: When servicing the workstation, be sure cables are placed in their proper locations during the reassembly process. Improper cable placement can damage the computer.

Removing the Fan from a Hard Drive Installed in Bays 5 or 6

NOTE: This section only applies if there is a fan installed over Bays 5 and 6. The fan is required only in high-altitude environments or when a hard drive faster than 7200 rpm is installed in Bay 5 or 6.

To remove the fan:

1. Perform the service preparations shown on page 3-2.
2. Remove the side access panel.
3. Disconnect the power cable.

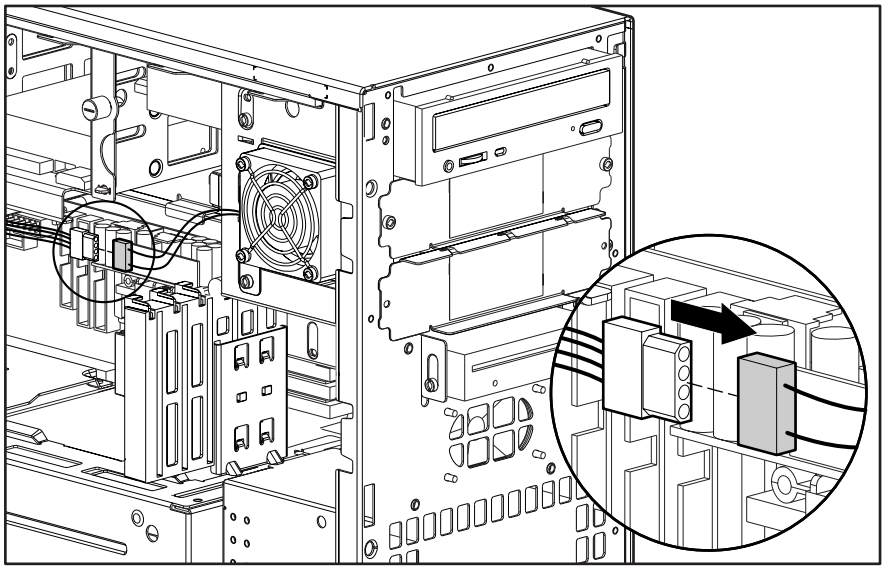


Figure 3-33. Disconnecting the power cable

4. Remove the screws that hold the fan in place and remove the fan.

   NOTE: The screws also secure the hard drive in that bay and must be replaced. **DO NOT** remove the screws from the CD-ROM drive. They are not used to install the fan.

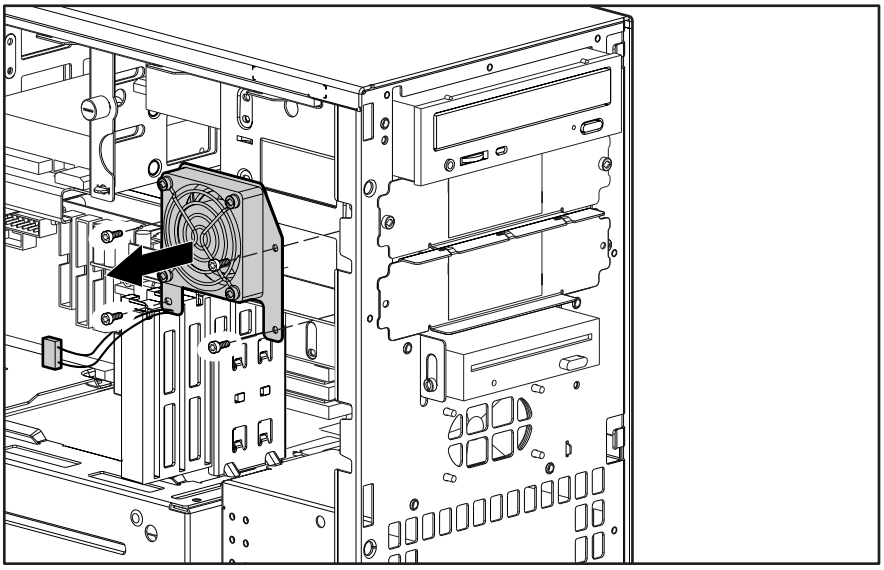


Figure 3-34. Removing the fan

To replace the fan, reverse the above procedure.

Removing a Hard Drive from the Removable Hard Drive Cage

The removable hard drive cage supports up to three 1.0-inch hard drives or two 1.6-inch hard drives. Other than using different screw holes, the removal and replacement for both drives is basically the same.

To remove a hard drive in the removable hard drive cage:

1. Perform the service preparations shown on page 3-2, then lay the workstation on its side.
2. Remove the following components:
   - ❑ Workstation feet
   - ❑ Side access panel
3. Disconnect the cables from the back of the hard drive(s).

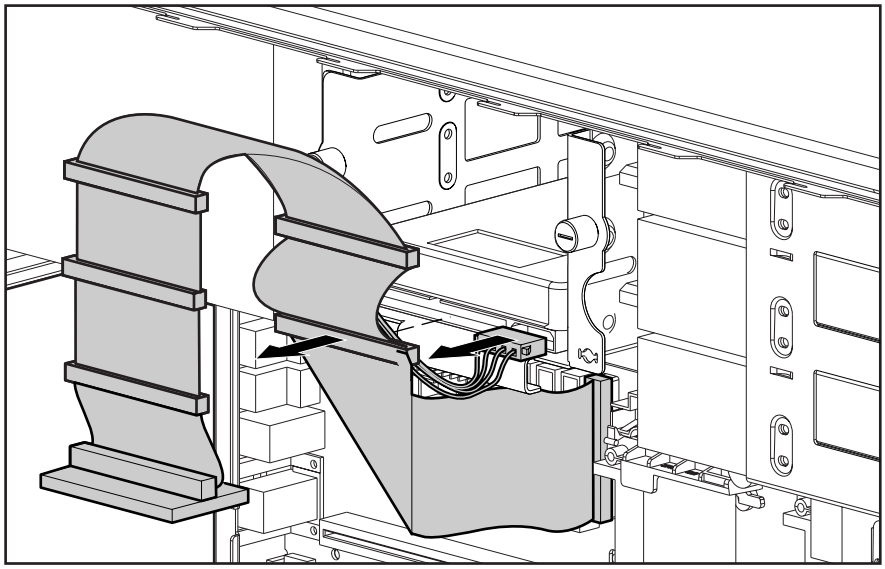


Figure 3-35. Disconnecting the cables from the back of a hard drive

4. Pull back the power supply air baffle ❶.
5. Loosen the two thumbscrews ❷ and slide the removable hard drive cage out ❸.

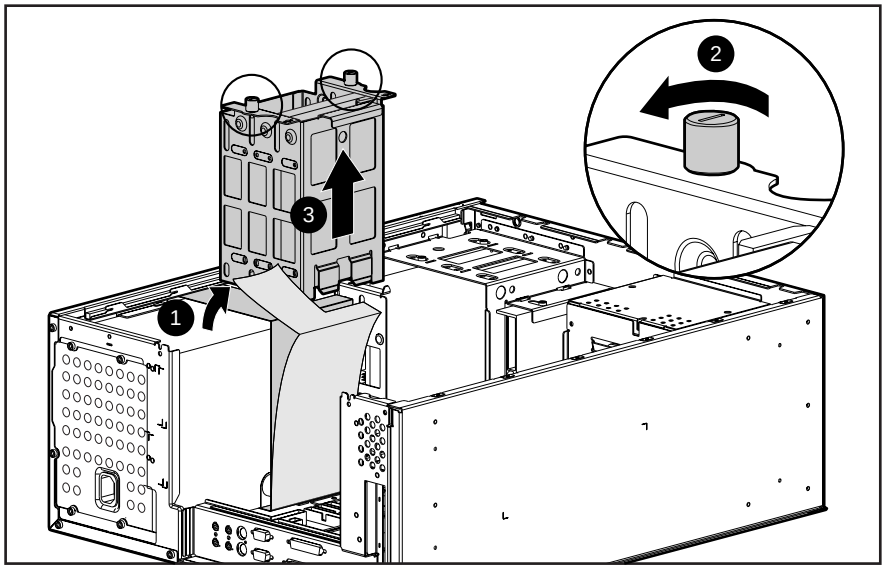


Figure 3-36. Removing the removable hard drive cage

6. Remove the four screws that secure the hard drive to the removable hard drive cage and pull the hard drive straight out.

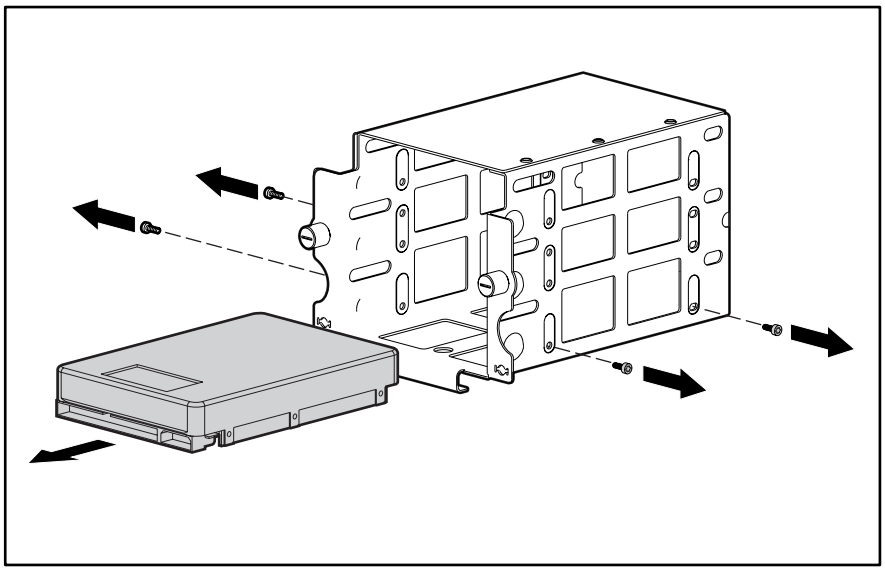


Figure 3-37. Removing a hard drive

CAUTION: When servicing the workstation, make sure cables are placed in their proper locations during the reassembly process. Improper cable placement can damage the workstation.

Installing a Hard Drive in the Removable Hard Drive Cage

To install a hard drive in the removable hard drive cage:

1. Perform the service preparations shown on page 3-2, then lay the workstation on its side.
2. Remove the following components:
   - ❑ Workstation feet
   - ❑ Side access panel
   - ❑ Removable hard drive cage
3. Remove the hard drive screws (top group of screws) from the side of the air plenum located at the front of the workstation.

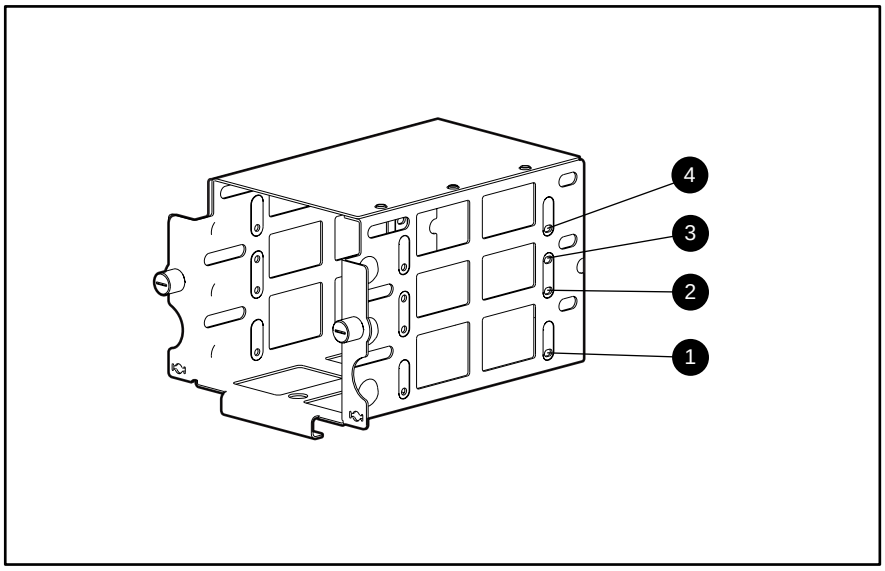


Figure 3-38. Locating the removable hard drive screw holes

Table 3-3
Removable Hard Drive Screw Holes

Reference	Bay
❹	Bay 3: 1.0-inch drive
❸	Bay 3: 1.6-inch drive
❷	Bay 2: 1.0-inch drive
❶	Bay 1: 1.0-inch drive

4. Insert the hard drive into the removable hard drive cage, and secure the drive with the four hard drive screws. (See the above illustration and table for the location of the correct screw holes for the hard drive you are installing.)

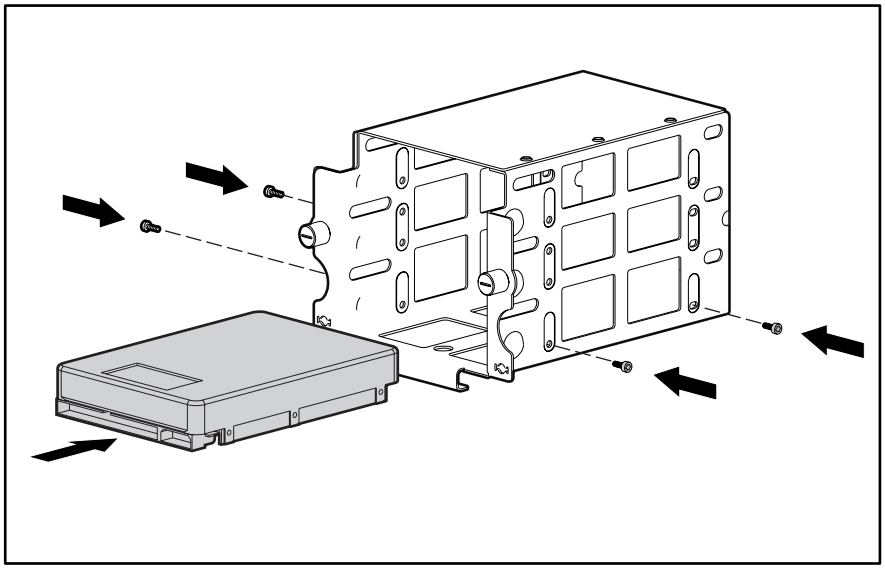


Figure 3-39. Inserting a hard drive in the removable hard drive cage

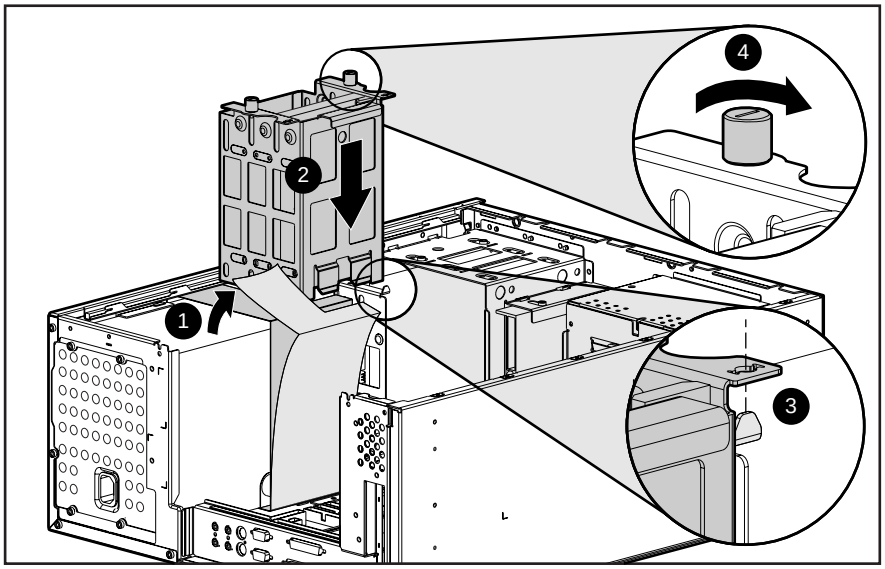


Figure 3-40. Reinstalling a removable hard drive cage

5. Pull back the air baffle ❶.
6. Slide the hard drive cage ❷ into place.
7. Align the tabs ❸ on the bottom of the cage with the workstation chassis.
8. Tighten the thumbscrews ❹.
9. Connect the signal and power cables to the hard drive.
10. Reassemble the workstation.

SCSI Cables and Guidelines

All workstation models use three areas for connecting mass storage SCSI devices: internally with hard drive in the removable hard drive cage, internally with storage devices in the front panel drive bays, and externally with external storage devices. The workstation has an integrated Wide-Ultra SCSI controller that has one internal connector on the system board and one external connector on the rear panel.

SCSI Cables

The workstation ships standard with a 5-device Wide-Ultra or Wide Ultra2 SCSI cable that has a terminator on one end. The other end of this cable connects to the internal Wide-Ultra SCSI connector on the system board. The first device connector of the cable connects to the hard drive in the removable hard drive cage. The cable has five connectors to handle up to five SCSI devices, a maximum of three in the removable hard drive cage and two in the front drive bay area.

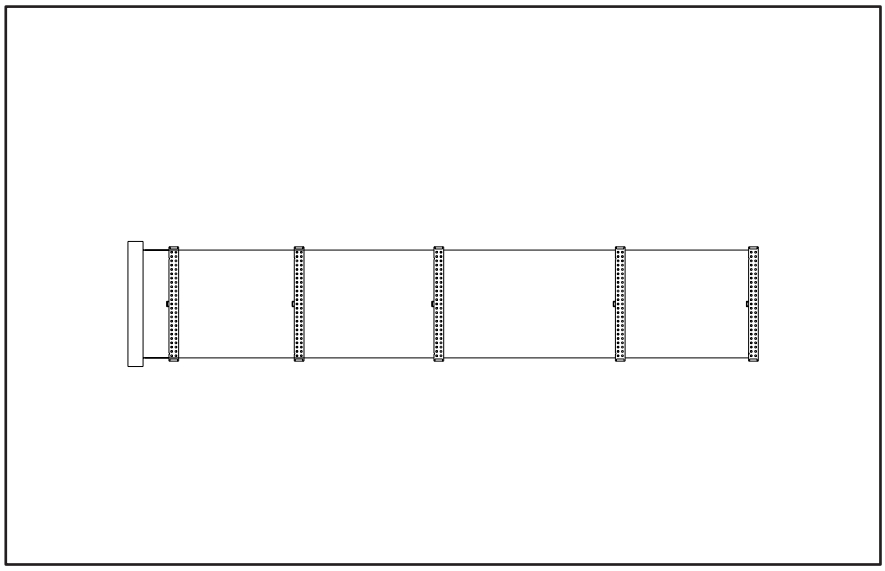


Figure 3-41. 5-device Wide-Ultra SCSI cable

NOTE: The SCSI cable included with the workstation may look slightly different than the one pictured.

When installing a Wide Ultra2 SCSI hard drive a Wide Ultra2 SCSI cable (not shown) is required.

SCSI Guidelines for Installing SCSI Devices

- If you are installing a narrow SCSI device, you will need to attach a 68- to 50-pin SCSI adapter to the narrow SCSI device.
- A maximum of seven SCSI devices may be installed on the integrated Wide-Ultra SCSI controller.
- A unique SCSI ID (0-6 and 8-15) must be set for each SCSI device installed.
- Before you install a SCSI device, verify the SCSI ID of the drive, and if necessary, set the SCSI ID to a unique ID number.
- The controller identifies a SCSI device by its SCSI ID (SCSI ID 1) number rather than its bay location (Bay 2). Therefore, moving a SCSI device from one bay location to another or changing the position of the device on the SCSI chain does not affect the communication between the controller and the SCSI device.
- The reserved and available SCSI ID numbers for SCSI devices are as follows:
  - SCSI ID 0 is reserved for the primary hard drive (bootable drive).
  - SCSI ID 7 is reserved for the controller.
  - SCSI IDs 1-6 and 8-15 are available. Do not use IDs 8-15 for narrow devices on the same SCSI bus.
- Bay 4 is reserved for the CD-ROM drive. Do not install a SCSI device in this bay.
- If only one SCSI hard drive is used, it should be installed on the lowest numbered bay (Bay 1).
- Every SCSI chain must be terminated (closed) at both ends.
- SCSI devices may not have terminating jumpers on the device. Determine if the device ought to have termination enabled or disabled. Set the termination if necessary. Termination on these devices must be achieved with a non-terminated cable.
- Turn on an external SCSI device before turning on power to the workstation. This enables the system board controller to recognize the external SCSI device.
- When an external SCSI device is connected to the external SCSI connector on the rear panel of the workstation, that device becomes the end of the SCSI chain and must be terminated.
- SCSI drives on the SCSI controller must be either internal or in an external storage system, but not both.

SCSI Guidelines for Optimizing Performance

- To maintain Ultra speeds, do not install more than four SCSI devices on a SCSI bus.
- Do not mix Wide-Ultra and narrow SCSI devices on the same SCSI chain or the same controller.

For additional information about optional SCSI devices, refer to the documentation included with the device.

System Board Assembly

The system board assembly contains the DIMMs, Pentium II or Pentium III processor/heat sink, Processor Power Module(s), system board with tray, the AGP Graphics Controller, and the external battery, if installed. Each of these components is spared separately. The components on the system board are illustrated in Figure 3-43. See Table 3-4 for component names.

CAUTION: Static electricity can damage the electronic components of the workstation. Before beginning these procedures, make sure you are properly grounded. See "Electrostatic Discharge Information" in Chapter 2.

System Board with Tray and Cage

To remove the system board with tray and cage:

1. Perform the service preparations shown on page 3-2, then lay the workstation on its side.
2. Remove the following components:
   - ❑ Workstation feet
   - ❑ Side access panel
   - ❑ I/O bracket assembly
3. Disconnect and remove all cables plugged into the system board.

IMPORTANT: Be sure to disconnect the system fan and speaker connectors located at the front of the system board before removing the system board with tray and cage.

4. Grasp the back edge of the system board with tray and slide it out of the chassis.

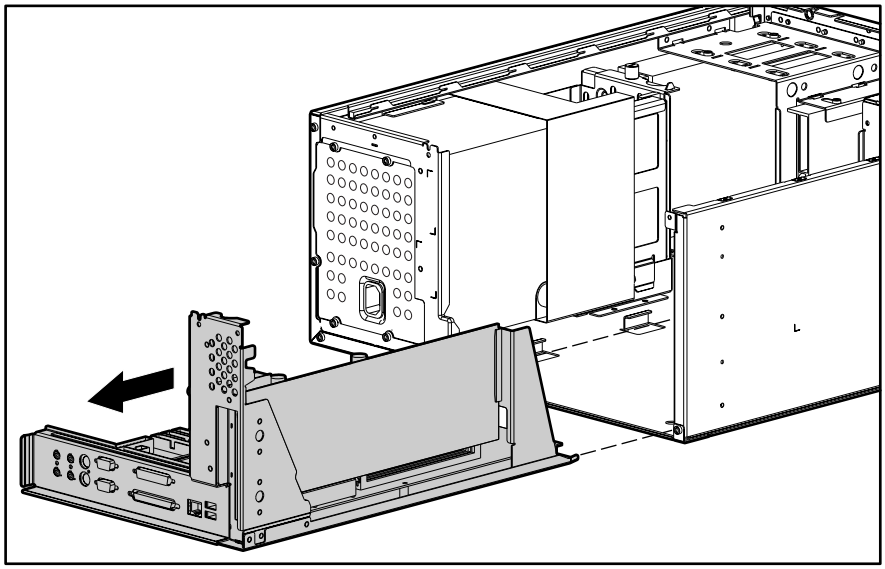


Figure 3-42. Removing the system board with tray and cage

To install a new system board with tray and cage:

1. Remove the following components from the system board with tray:
   - ❑ DIMMs
   - ❑ Processor(s)
   - ❑ Processor power module(s)
   - ❑ External battery (if installed)
2. Install the components on the new system board with tray. Before reinstalling the DIMMs, see "Important Guidelines for DIMM Installation" earlier in this chapter.
3. Slide the new system board with tray into the chassis.
4. Connect all cables to the system board.
5. Replace the I/O bracket assembly, the side access panel, and the workstation feet.

System Board Components

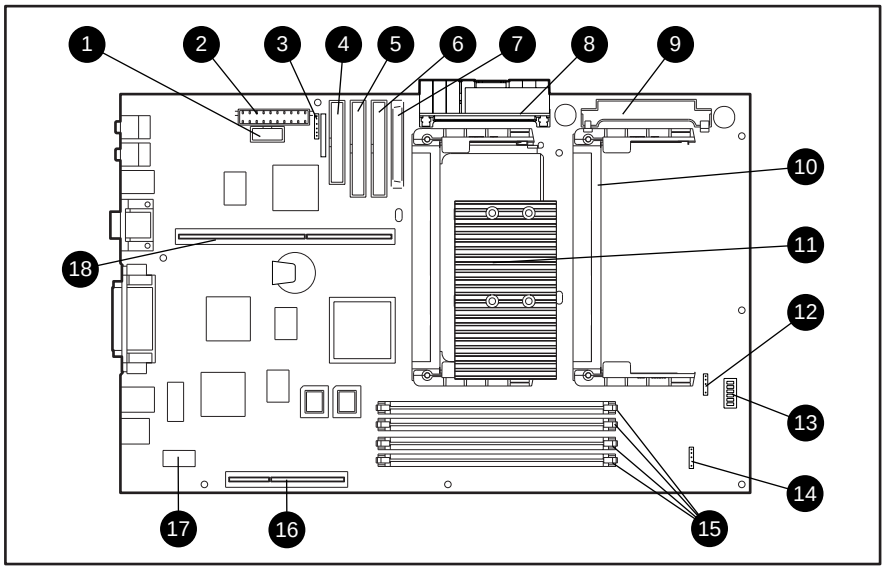


Figure 3-43. Identifying system board components

Table 3-4
System Board Components

Reference	Component
❶	Power Switch Connector and LED Header
❷	Power Connector
❸	External Battery Jumper
❹	Diskette Drive Connector
❺	Secondary IDE Connector
❻	Primary IDE Connector
❼	SCSI Connector
❽	Primary Processor Power Module
❾	Secondary Processor Power Module Slot
❿	Secondary Processor Slot
⓫	Primary Processor
⓬	Fan Headers
⓭	SW1 Switch
⓮	Speaker Header
⓯	DIMM Sockets 1- 4
⓰	AGP Graphics Controller Connector
⓱	Wake-On-LAN Connector
⓲	Expansion Board Connector

Dual Inline Memory Modules (DIMMs)

The Compaq Professional Workstation AP500 has four DIMM slots on the system board to support up to a maximum of 1 GB. See the following illustration for the physical location of the DIMM sockets.

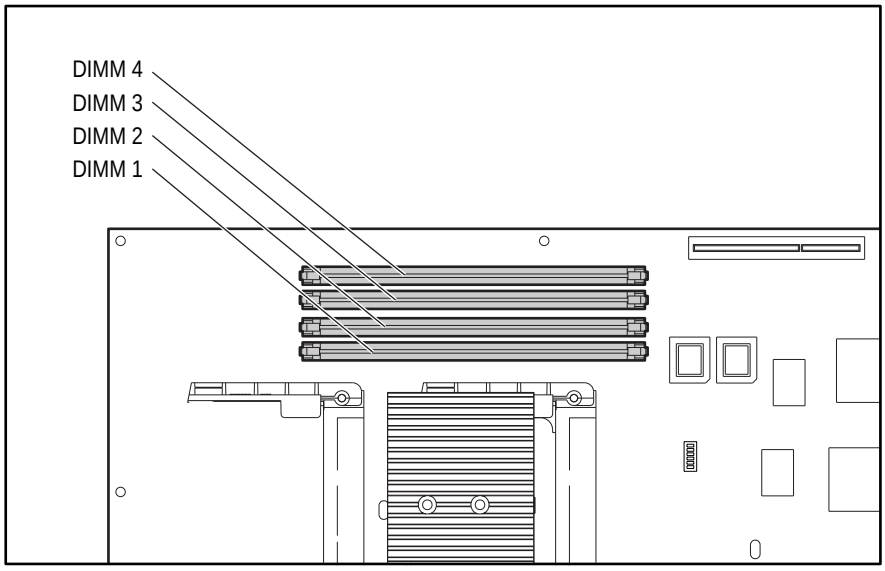


Figure 3-44. Overview of DIMM sockets

NOTE: DIMMs do not need to be installed in pairs, and can be installed in any of the available DIMM sockets. The DIMM sockets are numbered in sequence from 1-4. DIMM 1 is located closest to the processor, and DIMM 4 is located closest to the edge of the system board.

Important Guidelines for DIMM Installation

When installing DIMMs, you **MUST** follow these guidelines:

- Use only 32-, 64-, 128-, 256-MB Registered 100-MHz Error Checking and Correcting (ECC) SDRAM DIMMs.
- DIMMs must have a 4-KHz refresh rate.
- **DO NOT INSTALL DIMMS THAT DO NOT SUPPORT ERROR CHECKING AND CORRECTING (ECC).**
- A DIMM can be installed one way only. Be sure to match the two *key slots* on the DIMM with the tab on the DIMM socket. Push the DIMM down into the DIMM socket, ensuring that it is fully inserted and properly seated.
- When upgrading, do not exceed 1 GB total. Upgrades exceeding 1 GB will cause the system to halt.

Removing a DIMM

CAUTION: When handling a DIMM, be careful not to touch any of the contacts. Doing so may damage the DIMM.

CAUTION: Static electricity can damage the electronic components of the workstation or optional boards. Before beginning these procedures, ensure that you are properly grounded. See "Electrostatic Discharge Information" in Chapter 2.

To remove a DIMM:

1. Perform the service preparations shown on page 3-2, then lay the workstation on its side.
2. Remove the following components:
   - ❑ Workstation feet
   - ❑ Side access panel
   - ❑ AGP graphics controller, if necessary
3. Press outward on both latches of the DIMM at the same time ❶. This releases the module and pushes it partially out of the socket.
4. Lift the module from the socket ❷.

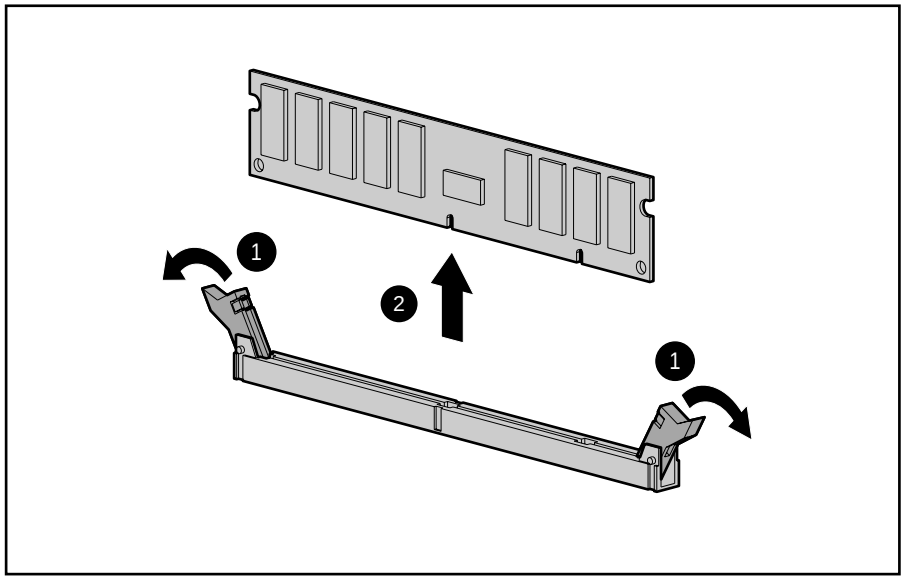


Figure 3-45. Removing a DIMM

To replace a DIMM, reverse the above procedure.

Processor and Heatsink Assembly

WARNING: To reduce the risk of personal injury from hot surfaces, allow the internal system components to cool before touching.

To remove the processor and heatsink assembly:

1. Perform the service preparations shown on page 3-2, then lay the workstation on its side.
2. Remove the following components:
   - ❑ Workstation feet
   - ❑ Side access panel
   - ❑ I/O bracket assembly
3. Push in the latches on each side of the processor until there are two clicks. This locks the tabs in the open position. Then slide out the processor.

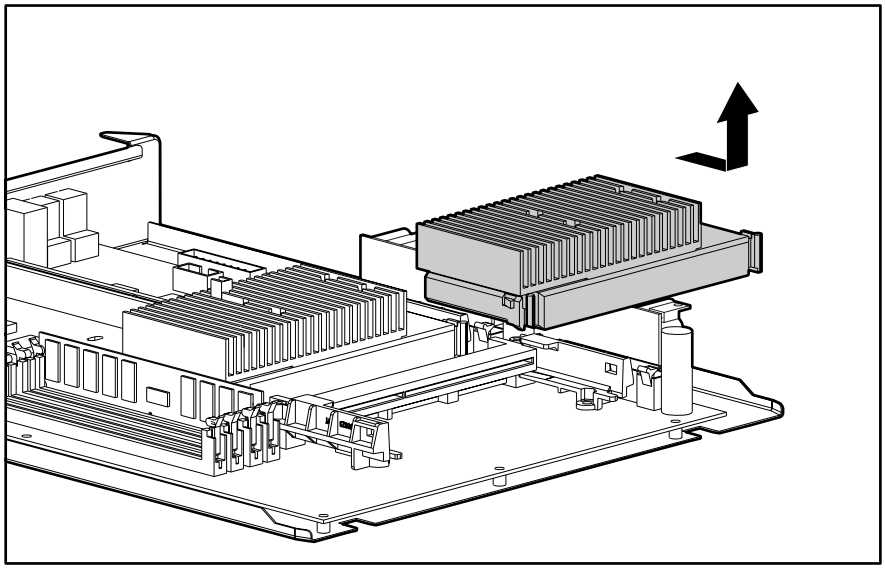


Figure 3-46. Removing the processor and heatsink assembly

To replace the processor and heatsink, reverse the above procedure.

NOTE: Install the primary processor/heatsink assembly in the primary processor slot. Appearance may vary depending upon the processor.

When replacing the processor, push the processor tabs outward. The tabs will click twice, locking the processor to the system board.

Processor Power Module

CAUTION: Static electricity can damage the electronic components of the workstation. Before beginning these procedures, make sure you are properly grounded. See "Electrostatic Discharge Information" in Chapter 2.

The processor power module (voltage regulator module) is located on the system board.

To remove the processor power module:

1. Perform the service preparations shown on page 3-2, then lay the workstation on its side.
2. Remove the following components:
   - ❑ Workstation feet
   - ❑ Side access panel
   - ❑ I/O bracket assembly

WARNING: To reduce the risk of personal injury from hot surfaces, allow the internal system components to cool before touching.

3. Press outward on both latches of the processor power module at the same time ❶, then lift the module from the system board ❷.

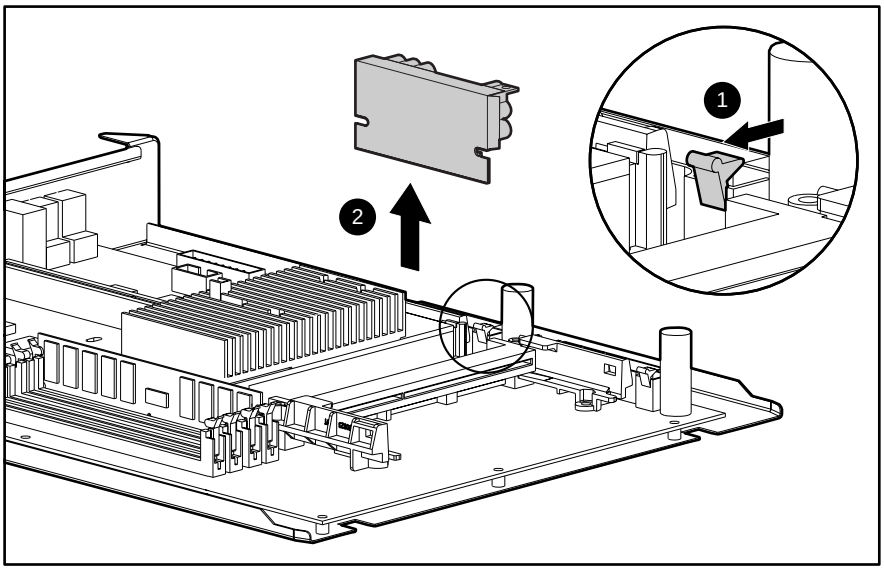


Figure 3-47. Removing the processor power module

To replace the processor power module, reverse the above procedure.

Primary Processor Power Module Cable Insulator

A cable insulator reduces damage to cables routed over the power module. If you are replacing the primary processor module, you must first remove the cable insulator from the module and place it on the new power processor module.

To remove the cable insulator:

1. Perform the service preparations shown on page 3-2, then lay the workstation on its side.
2. Remove the following components:
   - ❑ Workstation feet
   - ❑ Side access panel
   - ❑ I/O bracket assembly
   - ❑ Primary power processor module

WARNING: To reduce the risk of personal injury from hot surfaces, allow the internal system components to cool before touching.

3. Remove the cable insulator from the primary processor power module.

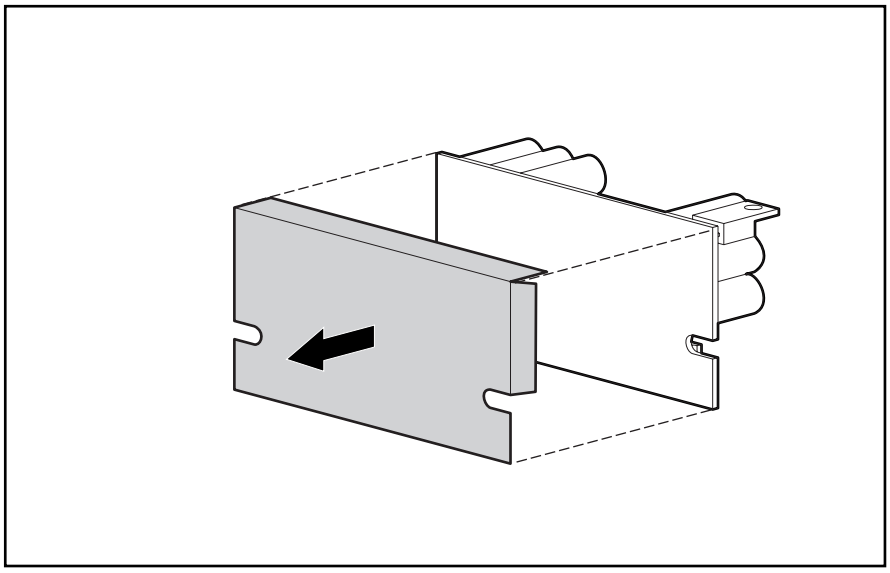


Figure 3-48. Removing the cable insulator

To reinstall the cable insulator, reverse the above procedure.

NOTE: Make sure you firmly press the primary processor power module and cable insulator into the primary power module connector. Then, secure the two latches on the connector.

External Battery

The real-time clock battery that came with the workstation is permanently installed on the system board. If the original battery becomes inoperative, you must install a replacement battery. Before attempting to install the replacement battery, read the following section.

Running Computer Setup

Computer Setup automatically detects and configures most Compaq components, including Compaq hard drives. If the workstation has a Compaq hard drive you do not need to run Computer Setup prior to installing the replacement battery. However, if the workstation has a third-party hard drive, you **MUST** complete the following steps before installing the replacement battery:

1. Run Computer Setup and record the drive type displayed in the System Configuration Summary.
2. If the drive type number is 65 or 66, record the drive parameters.

   Drives with these designators are user-defined types, also called soft-drive types. Whenever the nonvolatile memory (CMOS) has be come invalid, such as after the installation of a new battery, drive parameters must be entered manually for these user-defined drives.

After you have completed the battery installation, run Computer Setup and use the drive table parameters recorded earlier to reconfigure the system.

WARNING: The system board contains a clock/CMOS lithium battery. The lithium battery may explode if mistreated. The battery is soldered in and may not be removed. Do not abuse or disassemble. Use only replacement batteries supplied by Compaq Computer Corporation.

IMPORTANT: Make a set of backup diagnostics diskettes before installing a new battery.

NOTE: Drive parameters must be reentered after battery installation in order to reconfigure the hard drive. The hard drive is inoperable until the parameters are reentered.

Installing the Battery

> **CAUTION:** Static electricity can damage the electronic components of the workstation. Before beginning these procedures, make sure you are properly grounded. See "Electrostatic Discharge Information" in Chapter 2 for more information.

To install an external real-time clock battery:

1. Perform the service preparations shown on page 3-2, then lay the workstation on its side.
2. Remove the following components:
   - ❑ Workstation feet
   - ❑ Side access panel
   - ❑ I/O bracket assembly
3. Remove the backing from the adhesive on the hook-and-loop fastener strip and attach the battery near the J5 jumper.
4. Connect the battery connector to pins 1 - 4 on J5 ❶ and move the jumper from pins 6 and 7 to pins 5 and 6 ❷.

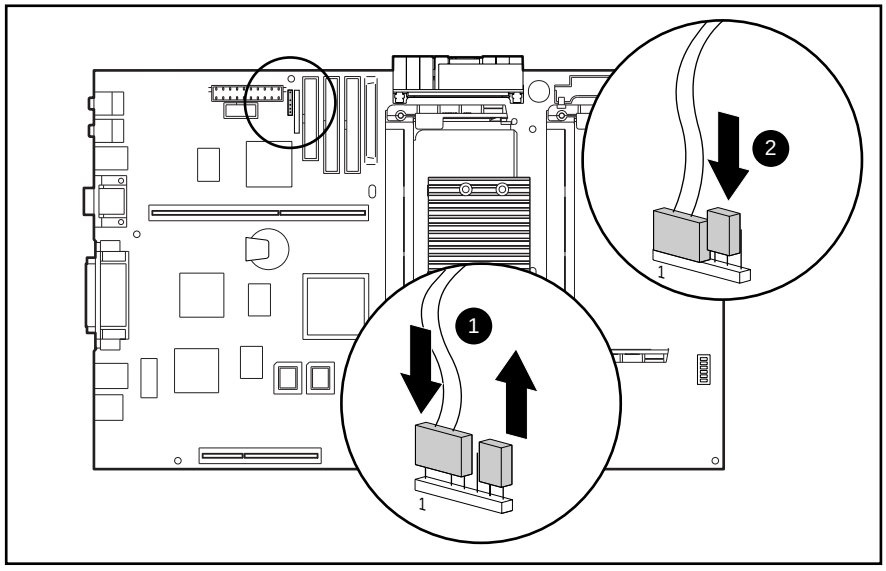


Figure 3-49. Installing the replacement battery

5. Replace the I/O bracket assembly and the side access panel.
6. Place the sticker included with your battery kit on the back of the workstation above the power connector.
7. Plug in the workstation and reconnect any external devices.

WARNING: This equipment is designed for connection to a grounded (earthed) outlet. The grounding type plug is an important safety feature. To avoid the risk of electrical shock or damage to the equipment, do not disable this feature.

8. Turn on the workstation.
9. Run computer setup to reconfigure the system.

- If the workstation has a Compaq hard drive, you have now successfully completed the installation.
- If the workstation has a third-party hard drive, you must reconfigure the hard drive using the parameters recorded earlier.

Power Switch Cable Assembly

The power switch cable assembly can be replaced without removing the power supply. To remove the power switch cable assembly:

1. Perform the service preparations shown on page 3-2.
2. Remove the following components:
   - ❑ Side access panel
   - ❑ Front bezel
   - ❑ CD-ROM drive or DVD-ROM drive (if installed)
3. Disconnect the power switch cable from the system board.
4. Remove the screws that keep the power switch cable assembly in place.
5. Remove the crown from the power switch cable assembly.
6. Gently slide the cable through the CD-ROM drive bay opening.
7. Remove the power switch cable assembly from the chassis.

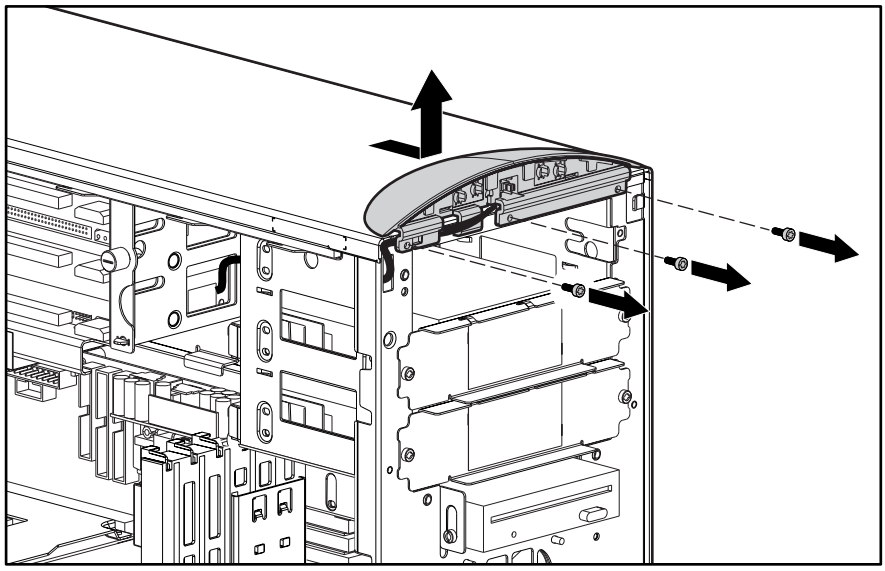


Figure 3-50. Removing the power switch cable assembly

To replace the power switch cable assembly, reverse the above procedure.

Power Supply

WARNING: This procedure should be performed only by qualified personnel. Do not reconnect power to the computer until the computer cover is replaced. Connecting the power before replacing the computer cover can result in personal injury or equipment damage.

WARNING: To reduce the risk of electric shock or damage to the equipment:

- If the system has multiple power supplies, disconnect power from the system by unplugging all power cords from the power supplies.
- Do not disable the power cord grounding plug. The ground plug is an important safety feature.
- Plug the power cord into a grounded (earthed) electrical outlet that is easily accessible at all times.

To remove the power supply:

1. Perform the service preparations shown on page 3-2, then lay the workstation on its side.
2. Remove the following components:
   - ❑ Workstation feet
   - ❑ Side access panel
   - ❑ I/O bracket assembly
   - ❑ Power supply air baffle
3. Disconnect all power cables.

NOTE: To facilitate reassembly, note the orientation of each cable connector and the routing of each cable before you remove it.

4. Remove the power supply air baffle from its position.

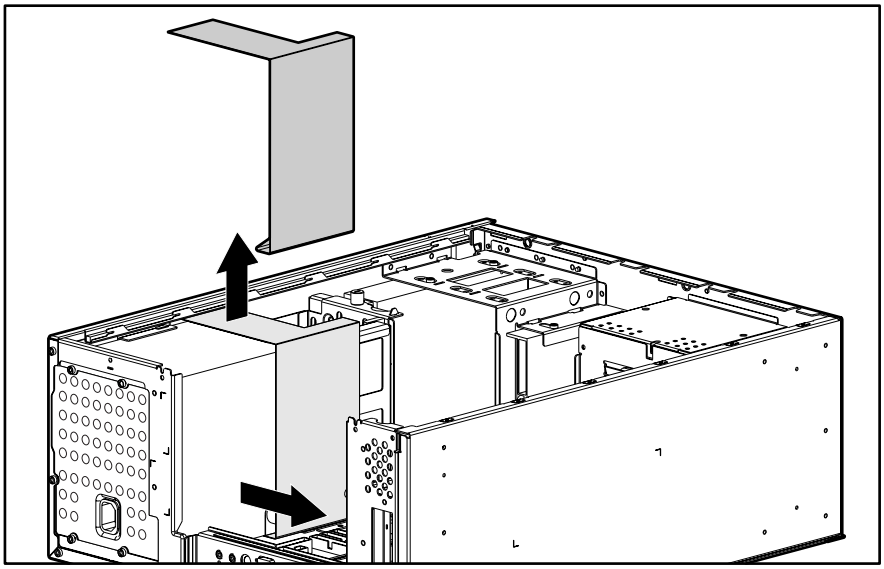


Figure 3-51. Removing the power supply air baffle

5. Remove the three screws that secure the power supply to the back of the chassis.
6. Slide the power supply toward the front of the chassis and pull up to remove it.

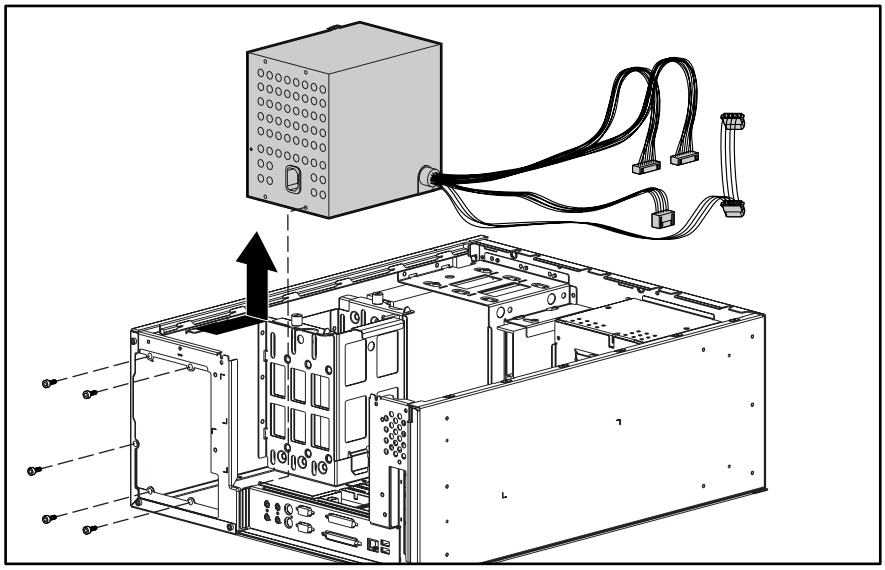


Figure 3-52. Removing the power supply

To replace the power supply, reverse the above procedure.

> **WARNING:** Do not reconnect power to the computer until to computer cover is replaced. Connecting the power before replacing the computer cover can result in personal injury or equipment damage.

Chapter 4
Diagnostic Tools

This chapter provides the following information to assist you when servicing the Compaq Professional Workstation AP500:

- Power-On Self-Test (POST)
- Compaq Utilities
- Error Codes
- ROMPaq
- Compaq Insight Manager
- Compaq Workstation SSD for Windows NT
- Compaq Diagnostics for Windows NT

IMPORTANT: Adherence to the procedures and precautions described in this chapter is essential for proper service.

Power-On Self-Test (POST)

POST is a series of diagnostic tests that run automatically when the system is turned on. After the computer is turned on, POST checks the following assemblies to make sure the computer system is functioning properly:

- Keyboard
- Memory
- Graphics controller
- Diskette drives
- IDE CD-ROM drive
- Hard drives
- Processors
- Controllers

POST also detects the type of SCSI mass storage devices installed in the workstation.

> **NOTE:** If the Power-On Password is set, a key icon ( ) displays on the screen while POST is running. You will need to enter the password before continuing. See Chapter 5 for information on deleting or bypassing the Power-On Password.

If POST finds an error in the system, an audible and/or visual message occurs. For explanations of the error codes and a recommended course of action, see Table 4-1 in the next section.

POST Messages

An error message results if POST encounters a problem. This test runs when the system is turned on, checking assemblies within the workstation and reporting any errors detected.

Table 4-1
POST Messages

Message	Beeps*	Probable Cause	Recommended Action
101-ROM Error	1L, 1S	System ROM checksum	Replace the system board.
101-Option ROM Checksum Error	1L, 1S	Option ROM checksum	1. Verify the correct system ROM. 2. Flash the system ROM to the latest revision, if required. 3. Contact Compaq technical support.
102-System Board Failure	None	DMA, timers, and so on.	Replace the Expansion Cage System Board. Run the Computer Setup utility.
162-System Options Error	2S	No diskette drive or mismatch in drive type	Run Computer Setup or Windows NT utilities.
162-System Options Not Set	2S	Configuration incorrect	Run Computer Setup or Windows NT utilities.
163-Time & Date Not Set	2S	Invalid time or date in configuration memory	Run Computer Setup or Windows NT utilities.
164-Memory Size Error	2S	Memory configuration incorrect	Run Computer Setup or Windows NT utilities.
172-1 Configuration Nonvolatile Memory Invalid	None	NVRAM configuration error	Allow system to completely boot. Reboot.
201-Memory Error	None	RAM failure	1. Run Computer Setup or Windows NT utilities. 2. Replace the DIMMs.
202-Memory Type Mismatch	None	Invalid memory configuration	1. Run Computer Setup or Windows NT utilities. 2. Replace the DIMMs.
203-Memory Address Error	None	RAM failure	1. Run Computer Setup or Windows NT utilities. 2. Replace the DIMMS. 3. Replace the system board.
205-Memory Error	None	Cache memory error	Run the Computer Checkup or Diagnostics utilities.

Continued

POST Messages *Continued*

Message	Beeps*	Probable Cause	Recommended Action
206-Secondary cache controller failure	None	Cache memory controller or RAM failure	Run the Computer Checkup and Diagnostics utilities.
207-ECC Corrected Single Bit Errors in DIMM Pair(s)	2S	A memory error on one of the installed DIMMs has been detected and corrected with the system's ECC logic. The workstation will continue to operate correctly with this error.	Run Diagnostics to get more information.
210-Invalid Memory Configuration Detected. Maximum of 1 Gbytes of Memory Supported. System Halted	None	Too much memory installed in system	Remove DIMM from socket.
212-Failed Processor	1L	Failed processor (X is 0 or 1)	Replace the processor and/or the Processor Power Module.
301-Keyboard Error	None	Keyboard failure	Verify that you do not have a key stuck or something on the keyboard. Ensure that the keyboard is plugged in. Replace the keyboard.
303-Keyboard Controller Error	None	I/O keyboard controller	1. Reconnect keyboard with computer turned off. 2. Replace the system board.
304-Keyboard or System Unit Error	None	Keyboard failure	1. Replace the keyboard. 2. Replace the system board.
40X-Parallel Port X Address Assignment Conflict	2S	Both external and internal ports are assigned to parallel port X.	Run Computer Setup or Windows NT utilities.
402-Monochrome Adapter Failure	1L, 2S	Monochrome display controller	Replace the monochrome display controller.
404-Parallel Port Address Conflict Detected	2S	Both external and internal ports are assigned to parallel port X.	Run Computer Setup or Windows NT utilities.
501-Display Adapter Failure	1L, 2S	Graphics display controller	Replace the graphics controller.
601-Diskette Controller Error	None	Diskette controller circuitry	1. Run Computer Setup. 2. Check and/or replace cables. 3. Replace diskette drive. 4. Replace the system board.

Continued

POST Messages *Continued*

Message	Beeps*	Probable Cause	Recommended Action
605-Diskette Drive Type Error	2S	Mismatch in drive type	Run Computer Setup or Windows NT utilities.
611-Primary Floppy Port Address Assignment Conflict	2S	Configuration error	Run Computer Setup or Windows NT utilities.
1151-System Board COM Port 1 Address Assignment Conflict	2S	Both external and internal serial ports are assigned to COM1	Run Computer Setup or Windows NT utilities.
1152-System Board COM Port 2 Address Assignment Conflict	2S	Both external and internal serial ports are assigned to COM2	Run Computer Setup or Windows NT utilities.
1155-COM Port Address Assignment Conflict	2S	COM port address conflict	Run Computer Setup or Windows NT utilities.
1610-Temperature Violation Detected	None	The system is too hot.	Turn off the workstation and let it cool off. If the condition persists, run Diagnostics to get more information.
1611-Fan Failure Detected	None	The fan is not operating properly.	Run Diagnostics to get more information. Replace the fan.
1720-IntelliSafe Hard Drive Detects Imminent Failure	None	IDE hard drive(s)	Back up contents and replace hard drive.
1720-SMART Hard Drive Detects Imminent Failure	None	SCSI hard drive(s)	Back up contents and replace hard drive.
1771-Primary Disk Port Address Assignment Conflict	2S	Internal and external IDE hard drive controllers are both assigned to the primary address.	Run Computer Setup or Windows NT utilities.
1772-Secondary Disk Port Address Assignment Conflict	2S	IDE Configuration	Run Computer Setup.
1780-Disk 0 Failure	None	IDE hard drive failure	Run Computer Setup.
1781-Disk 1 Failure	None	IDE hard drive failure	Run Computer Setup.
1782-Disk Controller Failure	None	IDE configuration failure	Run Computer Setup.
1790-Disk 0 Failure (Secondary)	None	IDE hard drive failure	Run Computer Setup.
1791-Disk 1 Failure (Secondary)	None	IDE hard drive failure	Run Computer Setup.
1792-Secondary Disk Controller Failure	None	IDE circuitry failure	Run Computer Setup.

Continued

POST Messages *Continued*

Message	Beeps*	Probable Cause	Recommended Action
1793-Secondary Controller or Disk Failure	None	An error has been detected with the CD-ROM interface.	Run Computer Setup.
A Critical Error Occurred Before this Power-Up.	None	Critical failure (POST) recorded into the wellness log.	None
Fixed Disk Parameter Table or BIOS Error System Halted	3L	Configuration or hardware failure	Run Computer Setup.
XX000Y ZZ Parity Check 2	None	Parity RAM failure	Run Computer Setup.
Audible (beep)	None	Power-on successful	None
Invalid Electronic Serial Number	None	Electronic serial number has become corrupted.	Run Computer Setup.
Audible	2S	Power-on successful	None
(RESUME = **F1** KEY)	None	As indicated to continue	Press **F1**.

* L = Long, S = Short

Troubleshooting Minor Problems

If minor hardware or software problems occur, refer to the following list for possible solutions before running any of the diagnostic utilities.

- Verify that the workstation is connected to a working grounded AC outlet.
- Is the workstation turned on and the power light illuminated?
- Check all cable connections. Be sure the connectors are seated properly.
- Is the monitor turned on and the power light illuminated?
- If the monitor is dim, turn up the brightness and contrast controls on the monitor.
- After the system has started, press the Num Lock key repeatedly. If the Num Lock light toggles on and off, the keyboard is OK.
- Are all of the necessary device drivers installed?
- Have all printer drivers been installed for each application?
- Was a nonbootable diskette loaded in the diskette drive at powerup?
- Was a bootable compact disc in the CD-ROM drive at powerup?
- Check all switch and jumper settings.
- Was Computer Setup run after installing options (memory, disk drives, expansion boards, for example) and industry-standard architecture (ISA) boards?

In addition to the above checklist, see the next few sections for other possible solutions to:

- Power Problems
- Diskette Drive Problems
- Display Problems
- Printer Problems
- Hard Drive Problems
- Hardware Installation Problems
- IDE CD-ROM and DVD-ROM Drive Problems
- Memory Problems
- SCSI Problems
- Network Problems
- Audio Hardware Conflicts

Power Problems

This section identifies some quick checks for power-related problems.

Table 4-2
Solutions for Power Problems

Problem	Possible Solution
Computer will not turn on.	Be sure the workstation is connected to a working grounded AC outlet.
	Be sure the processor(s) and terminator board are properly seated.
	Check to see if cables to the external power source are unplugged. Be sure cables connecting the workstation and the external source are plugged in properly. Be sure cables from the workstation's power supply are properly plugged in to the system board.
	A PCI or ISA card that has been installed is not seated properly or is defective. Be sure that the card is fully inserted, or remove the PCI or ISA card that was just installed.
System will not boot.	If the LED is a steady amber color, reseat the I/O bracket assembly (expansion board assembly).
Computer does not automatically display the date and time.	The real-time clock (RTC) battery may need to be replaced.
Computer powered off automatically.	The maximum safe unit temperature may have been exceeded. Turn off the unit and allow it to cool.
	ACPI may be the cause. Unplug the unit from AC power and wait 10 seconds. Plug unit back in and restore power.

Diskette Drive Problems

This section identifies some quick checks for diskette drive-related problems.

Table 4-3
Solutions for Diskette Drive Problems

Problem	Possible Solution
Diskette drive light stays on.	1. Diskette might be damaged. Run CHKDSK on the diskette. 2. Diskette could be installed incorrectly. Remove the diskette and reinsert. 3. Software program may be damaged. Check the program diskettes. 4. Diskette not fully inserted. Eject and try inserting again. 5. Drive cable is not properly connected. Reconnect drive cable.
Diskette drive cannot write to a diskette.	1. Diskette is not formatted. Format the diskette. 2. Diskette is write-protected. Either use another diskette that is not write-protected or disable the write protection on the diskette. 3. Writing to the wrong drive. Check the drive letter in the path statement. 4. Not enough space is left on the diskette. Use another diskette to write the information. 5. Diskette write control is disabled. Check the security feature settings.
Diskette drive cannot read a diskette.	1. Diskette is not formatted. Format the diskette. 2. Using the wrong diskette type for the drive type. Use a diskette that is compatible with the drive. 3. Reading the wrong drive. Check the drive letter in the path statement. 4. Diskette drive has been disabled. Run Computer Setup and enable the diskette drive.
A problem has occurred with a disk transaction.	The directory structure is bad or there is a problem with a file. Run Disk Administrator. At the Start menu, highlight *Programs* and select *Administrator Tools*.
Non-system disk message	Remove the diskette from the drive.
Drive not found.	Check the cables for loose connections.

Display Problems

This section identifies some quick checks for display-related problems.

Table 4-4
Solutions for Display Problems

Problem	Possible Solution
Screen is blank.	1. Monitor is not turned on and the monitor light is not on. Turn on the monitor and verify the monitor light is on. 2. Screen save has been initiated. Press any key or move the mouse to light the screen. Wait a few seconds for the screen to be active. 3. Check the cable connection from the monitor to the workstation and check the grounded AC outlet. 4. The brightness needs adjusting. Adjust the brightness control. 5. The QuickBlank feature has been enabled through Security Management. Run Computer Setup and disable the QuickBlank feature. 6. The energy saver feature has been enabled. Press any key or type the password. Wait a few seconds for the screen to become active. 7. The RGB (Red, Green, Blue) input switch on the back of the monitor is incorrectly set. Set the monitor's input switch to 75 ohms. If there is a sync switch, set it to External. 8. If a fixed-sync monitor is used, be sure the monitor can accept the same sweep rate as the resolution chosen. 9. Verify the graphics adapter is fully and properly inserted in the PCI or AGP slot.
Graphics colors are wrong.	1. If the BNC cable is used, make sure that the Red, Green, and Blue BNC cables are connected to the corresponding monitor connectors. 2. Be sure the monitor's RGB inputs are set to 75 ohms.
Characters are dim.	1. Adjust the monitor's brightness and contrast controls. 2. Verify the video cable is securely connected to the video card and monitor. 3. Set the RGB switch (and sync options, if available) to 75 ohms, with the sync set to External. Refer to the documentation included with the monitor.
Monitor does not function properly when used with the energy saver features.	A monitor without the energy saver feature is being used with energy saver features enabled. Disable the monitor energy saver feature.
Blurry display or requested resolution cannot be set.	If the graphics controller was upgraded, the correct display drivers may not be loaded. Install the correct display drivers on the diskette included in the upgrade kit.

Continued

Solutions for Display Problems *Continued*

Problem	Possible Solution
The picture is broken up; it rolls, jitters, or blinks.	1. Be sure the monitor cable is securely connected to the computer. 2. In a 2-monitor system or if another monitor is in close proximity, the monitors may interfere with each other's magnetic field. Move them farther apart.
Screen goes blank.	A screen blanking utility may be installed or energy saver features are enabled. Press any key or type password. Wait a few seconds for the screen to become active.
Monitor overheats.	There is not enough ventilation space for proper airflow. Leave at least 3 inches (7.6 cm) of ventilation space. Also, be sure there is nothing on top of the monitor to obstruct air flow.
Cursor will not move using the arrow keys on the numeric keypad.	The Num Lock key is on. Press the Num Lock key. The Num Lock light should not be on when you want to use the arrow keys.

Printer Problems

This section identifies some quick checks for printer-related problems.

Table 4-5
Solutions for Printer Problems

Problem	Possible Solution
Printer will not print.	1. Printer is not turned on and online. Turn the printer on and make sure it is online. 2. The correct printer drivers for the application are not installed. Install the correct printer drivers for the application. 3. If the workstation is on a network, you may not have made the connection to the printer. Make the proper network connections to the printer.
Printer will not turn on.	The cables may not be connected properly. Reconnect all cables and check the power cord and electrical outlet.
Prints garbled information.	1. The correct printer drivers for the application are not installed. Install the correct printer driver for the application. 2. The cables may not be connected properly. Reconnect all cables.
Printer is off-line.	The printer may be out of paper. Check the paper tray and refill it if it is empty. Select online.

Hard Drive Problems

This section identifies some quick checks for hard drive-related problems.

The information provided by the diagnostics test includes error code, system serial number, drive serial number, drive model, and drive firmware revision. Specific details of the drive failure are not included.

When you run the diagnostics, the test results are stored in a log. After completing the test, you can print this log to a local printer or save it to a file. Alternatively, before running the test, you can configure the test options to send the results to a local printer or file.

Solutions for some typical hard drive problems are presented in the following table.

Table 4-6
Solutions for Hard Drive Problems

Problem	Possible Solution
Hard drive error occurs	Hard disk has bad sectors or has failed. Use a utility to locate and block usage of bad sectors. If necessary, reformat the hard disk.
Disk transaction problem	Either the directory structure is bad or there is a problem with a file. When using Windows NT, run Disk Administrator. At the Start menu, highlight *Programs* and select *Administrator Tools*.
Drive not found	1. Cable could be loose. Check cable connections. 2. Check SCSI IDs to be sure they are not duplicated.
Nonsystem disk message	1. The system is trying to start from a diskette that is not bootable. Remove the diskette from the diskette drive. 2. The system is trying to start from the hard drive but the hard disk has been damaged. Insert a bootable diskette into the diskette drive and restart the workstation. 3. Diskette boot has been disabled in Computer Setup. Run Computer Setup and enable diskette boot.

Hardware Installation Problems

This section identifies some quick checks for hardware-related installation problems.

Table 4-7
Solutions for Hardware Installation Problems

Problem	Possible Solution
A new device is not recognized as part of the computer system.	1. The Computer Setup utility has not been run to configure the new device. Run the Computer Setup utility. 2. When the system advised you of changes to the configuration, you did not accept them. Reboot the workstation and follow the instructions for accepting the changes. 3. The system may not have automatically recognized the new device. Run Computer Setup and identify the new device. 4. A Plug-and-Play board may not automatically configure when added if the default configuration conflicts with other devices. Use Computer Setup to deselect the automatic settings for the board and choose a basic configuration that doesn't cause a resource conflict. 5. The cables for the new external device are loose or the power cables are unplugged. Check all cables. 6. The power switch for the new external device is not turned on. Turn off the workstation, turn on the external device. Then turn on the workstation to integrate the new device. 7. If the drive is a secondary drive that has just been installed on the same controller as the primary drive, verify that the jumpers for both drives are set correctly.

CD-ROM Drive and DVD-ROM Drive Problems

This section identifies some quick checks for IDE CD-ROM and DVD-ROM drive-related problems.

Table 4-8
Solutions for CD-ROM and DVD-ROM Drive Problems

Problem	Possible Solution
Cannot read compact disc	1. CD is not properly seated in the drive. Eject the CD, correctly seat it in the drive, then reload. 2. CD has been loaded upside down. Eject the CD, turn it over, then reload.
System will not boot from CD-ROM drive	1. The CD-ROM boot is not enabled through the Computer Setup utility. Run the Computer Setup utility and set the drive priorities. 2. Be sure that drive cabling and jumpers are set correctly.
Cannot eject compact disc	CD is not properly seated in the drive. Turn off the workstation, insert a thin metal rod (a straightened paper clip can be used) into the emergency eject hole, and push firmly. Slowly pull the tray out from the drive until the tray is fully extended, then remove the CD.
CD-ROM device is not detected; driver is not loaded	CD-ROM drive is not connected properly. Open the workstation. Verify the drive cable is connected properly.

Memory Problems

This section identifies some quick checks for memory-related problems.

Table 4-9
Solutions for Memory Problems

Problem	Possible Solution
Out of Memory error	1. Run Computer Setup or Windows NT utilities. 2. The workstation has insufficient memory to run the application. Check the application documentation to determine the memory requirements.
Memory count during POST is wrong	The DIMMs may not be installed correctly. Verify that the DIMMs have been installed correctly in the DIMM sockets, then run the Setup utility.
Out of memory error during operation	The system has insufficient memory for the application. Check the memory requirements for the application or install additional memory.

SCSI Problems

Some common causes and solutions for SCSI device problems are listed in the following table.

Table 4-10
Solutions for SCSI Problems

Problem	Possible Solution
System will not boot from a SCSI drive.	Be sure that drive cabling and jumpers are set correctly. To boot to a SCSI drive, the drive with the lowest SCSI number will be the boot drive. No two drives can have the same SCSI number. See Figures 6-3, 6-4, and 6-5 for instructions on selecting SCSI ID.

Network Problems

This section provides some common causes and solutions for network problems. However, the process of debugging network cabling is not discussed.

Table 4-11
Solutions for Network Problems

Problem	Cause	Solution
System does not detect a network controller.	1. Possible driver problem 2. Possible failed network controller	1. Load latest version of Compaq Workstation SSD for Windows NT. 2. Replace the system board.
System Setup utility reports unprogrammed EPROM.	1. The network controller is defective. 2. Network drivers are not loaded.	1. Replace the controller or the system board. 2. Boot the workstation without the network drivers. Using a system boot diskette, reconfigure the network controller.
Diagnostics reports a failure.	1. The cable is not securely connected. 2. The cable is attached to the incorrect connector. 3. There is a problem with the cable or a device at the other end of the cable. 4. The network controller is defective. 5. Network controller interrupt or memory overlaps the interrupt or memory of an expansion board.	1. Be sure the cable is securely attached to the network connector and the other end of the cable is securely attached to the correct device. 2. Be sure the cable is attached to the correct connector. 3. Be sure the cable and device at the other end are operating correctly. 4. Replace the controller or the system board. 5. Run Computer Setup and modify the network controller memory value.
Diagnostics passes, but the system does not communicate with the network.	1. Network drivers are not loaded, or driver parameters do not match current configuration. 2. The network controller is not configured for the workstation. 3. The network controller interrupt or memory overlaps the interrupt or memory of an expansion board.	1. Be sure the network drivers are loaded and the driver parameters match the configuration of the network controller. 2. Select the Network icon at the Control Panel. Reconfigure the driver if necessary, using the Network Setup found in the Control Center. 3. Run Computer Setup and modify the network controller memory value.

Continued

Solutions for Network Problems *Continued*

Problem	Cause	Solution
Network controller stopped working when an expansion board was installed.	1. Network drivers are not loaded or driver parameters do not match the current configuration. 2. The cable is not securely connected. 3. The network controller interrupt or memory overlaps the interrupt or memory of another expansion board. 4. The network controller requires drivers. 5. The files containing the network drivers are corrupted.	1. Be sure the network drivers are loaded and the driver parameters match the configuration of the network controller, using Network Setup found in the Control Center. 2. Be sure the cable is securely attached to the network connector and the other end of the cable is securely attached to the correct device. 3. Run Computer Setup and modify the network controller memory value. 4. Verify that the drivers were not accidentally deleted when the drivers for a new expansion board were installed. 5. Reinstall the network drivers using the SmartStart for Workstations CD, then run Computer Setup.
Network controller stopped working without apparent cause.	1. The files containing the network drivers are corrupted. 2. The cable is not securely connected. 3. The network controller is defective.	1. Reinstall the network drivers using the SmartStart for Workstations CD, then run Computer Setup. 2. Make sure the cable is securely attached to the network connector and the other end of the cable is securely attached to the correct device. 3. Replace the network controller or the system board.

Audio Hardware Conflicts

This section provides solutions to hardware conflicts. Hardware conflicts occur when two or more peripheral devices contend for the same signal lines or channels. Conflicts between the audio interface and another peripheral device may be because of the settings of the base I/O addresses, interrupts, or DMA channels. The audio interface typically has the following settings:

- Base I/O address 220H
- OPL III I/O address 388-38Bh
- Interrupt IRQ 5
- 8-bit DMA Channel 1 and Channel 0 or 3

To resolve hardware conflicts:

1. Change the hardware settings of the audio card or the peripheral card in your system if the peripheral card is using the audio interface setting.
2. If you are unsure of the settings of the peripheral cards, you can isolate the source of the problem by temporarily removing all cards. After that, add the cards back one at a time until the card that is causing the conflict is found.

Compaq Setup and Diagnostics Utilities

The Compaq Professional Workstation AP500 provides setup and diagnostic utilities that you can use to configure the workstation's hardware, resolve resource conflicts, run diagnostic tests, and view information about the workstation. This software includes Compaq Utilities that are preinstalled on a hard drive partition and ROM BIOS (Read Only Memory Basic Input/Output System). The Compaq Utilities menu consists of the following choices:

- Create a Diagnostics Diskette
- Computer Setup
- Computer Checkup (TEST)
- View System Information (INSPECT)
- Manage Diagnostics Partition

Explanations and procedures for each utility are included later in this chapter.

Compaq Utilities should be run in the following instances:

- When a system configuration error is detected during the Power-on Self-Test (POST).
- To change the factory default settings for some of the workstation features.
- To change the system configuration, which is sometimes necessary upon adding or removing optional hardware.
- To set system configuration features.

Accessing the Compaq Utilities Menu

IMPORTANT: If you have reformatted the hard drive and removed the hard drive partition that contains the Compaq Utilities, you can reinstall it by using the Compaq SmartStart for Workstations CD, or you can download Setup and User Diagnostics from the Compaq website at www.compaq.com.

To access the Compaq Utilities menu:

1. Turn on or restart the workstation. If Windows NT is running, click *Start, Shut Down, Restart the computer*.
2. When you see the words **F10=Setup** in the bottom-right corner of the screen, press **F10.**

   NOTE: If you do not press the **F10** key while the message is displayed, you must turn off the workstation, then on again, to access the utility.

3. When prompted, select the desired language.
4. Press **Enter** to bypass the title and welcome screens. The Compaq Utilities menu displays.

Creating a Diagnostics Diskette

This option allows you to create Setup or Diagnostics diskettes from the diagnostics partition. To create these diskettes:

1. Access the Compaq Utilities menu.
2. From the Compaq Utilities menu, select *Create a Diagnostics Diskette*.

One Diagnostic and two Setup diskettes will be created.

NOTE: The Diagnostics and Setup diskettes can also be created by downloading the latest version from the Compaq website at www.compaq.com.

To access TEST or INSPECT:

1. Insert the Diagnostic diskette into drive A.
2. Turn on or restart the workstation. If Windows NT is running, click *Start, Shut Down, Restart the computer*.
3. Press **Enter** to bypass the Welcome to Compaq Utilities screen.

NOTE: Procedures for running each Compaq Utilities menu option (Computer Setup, TEST, INSPECT) are included later in this chapter.

Computer Setup

Computer Setup allows you to configure the workstation's hardware and resolve resource conflicts.

Using Computer Setup

To use Computer Setup, select *Computer Setup* from the Compaq Utilities menu. The following table describes the features available in Computer Setup.

Table 4-12
Computer Setup Features

Task	Computer Setup Selection
View the product name, processor type/speed/stepping, CPU serial number, system ROM date, system board revision, installed memory size, and asset tracking number.	Click *Built-in Devices,* then click *System Information.*
Set the system time and date.	Click *Built-in Devices,* then click *System Information.* Click *Date/Time.*
Set the Asset Tag.	Click *Built-in Devices,* then click *System Information.* Under *System Parameters,* enter the new *Asset Tag.*
Set the POST mode (Quick Boot or Full Boot) and enable/disable POST messages.	Click *Built-in Devices,* then click *System Information.* Select the appropriate options under *Quick Boot* and *POST Messages Descriptive/Clean Mode.*
Set ISA back-to-back I/O (fast/legacy) delay and bus priority (ISA/PCI).	Click *Built-in Devices,* then click *System Information.* Under *System Parameters,* select the appropriate *I/O Delay.*
View the currently installed drive A: (preinstalled diskette drive) and drive B: devices and set resources for diskette drives.	Click *Built-in Devices,* then click *Storage.* The information is displayed under *Diskette.*
Enable/disable diskette booting and diskette writing. **NOTE:** After saving changes to Removable Media, the workstation will restart. Turn the workstation off, then on, manually.	Click *Built-in Devices,* then click *Storage.* Select the appropriate option under *Removable Media.*
View information regarding IDE devices connected to the system. **NOTE:** ATAPI devices (CD-ROM, tape) are listed as ATAPI devices.	Click *Built-in Devices,* then click *Storage.* The information is displayed under *IDE Devices.*
Enable/disable serial and parallel port and/or set resources for onboard system devices (serial port, parallel port, and so on).	Click *Built-in Devices,* then click *Communications.* Select the appropriate options under *Serial Ports* or *Parallel Port.*

Continued

Computer Setup Features *Continued*

Task	Computer Setup Selection
Set the printer mode (flexible/standard).	Click *Built-in Devices,* then click *Communications.* Under *Parallel Port,* select the appropriate *Bi-directional Port.*
Set the Num Lock state at power-on.	Click *Built-in Devices,* then click *Input Devices.* Under *Keyboard,* turn on *Num Lock State At Power-on.*
Disable energy saver mode.	Click *Built-in Devices,* then click *Power Management.* Select *Energy Saver Disabled.*
Select timeout values. **NOTE:** These selections appear only the when energy saver mode is set (default).	Click *Built-in Devices,* then click *Power Management.* Under *Hard Drive* and/or *Monitor*, select the *Timeout* value.
Enable/disable power LED blink in suspend mode **NOTE:** This selection does not appear if the energy saver mode is disabled.	Click *Built-in Devices,* then click *Power Management.* Select *Blink LED during Energy Saver.*
Enable the Power-On Password.	Click *Built-in Devices,* then click *Security Management.* Under *Power-On Password,* click *Set.*
Enable/disable keyboard QuickLock, QuickBlank screen when locked, and QuickLock in energy saver mode. **NOTE:** These selections appear only if a Power-On Password is set.	Click *Built-in Devices,* then click *Security Management.* Under *Power-On Password,* select the appropriate options.
Enable the Setup (administrator) Password.	Click *Built-in Devices,* then click *Security Management.* Under *Setup Password,* select *Enable Setup Password.*
View current settings of Plug and Play (PnP) devices and set resources for installed boards.	Click *Integrated and Add-in Devices,* then click *ISA Boards.*
View the currently installed PCI devices and view and/or reconfigure settings (IRQ, I/O, DMA, memory).	Click *Integrated and Add-in Devices,* then click *PCI Boards.*
Enable/disable the SCSI controller boot order for Compaq SCSI options.	Click *Integrated and Add-in Devices,* then click *PCI Boards.* Under *SCSI Controller Boot Order,* select *Enable Boot Order.*
Enable/disable PCI bus mastering, PCI VGA palette snooping, and interrupt sharing.	Click *Integrated and Add-in Devices,* then click *PCI Boards.* Under *System Options,* select the appropriate options.
Restore factory default settings and exit Computer Setup.	Select *File,* then select *Set Defaults and Exit.*
Exit Computer Setup without applying or saving any changes.	Select *File,* then select *Exit Without Saving Changes.*
Save changes to the system configuration and exit Computer Setup.	Select *File,* then select *Save Changes and Exit.*

Computer Checkup (TEST)

Computer Checkup (TEST), the primary diagnostics utility, confirms whether the various workstation devices are recognized by the system and are functioning properly. Use the TEST utility to help set up tests, to test the workstation, and to install the operating system.

The TEST option, which may vary by product, checks the following:

- Processors
- Keyboard
- Pointing device interface
- Parallel interface
- Graphic controllers
- Diskette drives
- Fixed disk drives
- Serial interfaces
- Installed Compaq devices (tape drive, SCSI device, or network controller)

To run TEST:

1. Turn on only the external devices that you want to test. You may want to leave the printer connected to log error messages.
2. Access the Compaq Utilities menu.
3. Select *Computer Checkup (TEST).*
4. Select the option to view the device list. After a few minutes, a list of installed hardware devices is displayed.
5. Verify that the TEST utility correctly detected the devices installed. If the list is correct, select *OK.* The test option menu is displayed again. If the list is incorrect, be sure that any new devices are installed properly.

NOTE: This utility may not detect non-Compaq devices**.**

6. Select one of the following from the test option menu:

   - **Quick Check Diagnostics** runs a quick, general test on each device with a minimum number of prompts. If errors occur, they are displayed when the test is complete.
   - **Automatic Diagnostics** runs unattended and provides maximum testing of each device with minimum prompts. You can choose how many times to run the tests, to stop on errors, or to print or file an error log.
   - **Prompted Diagnostics** allows maximum control over the device testing process. You can choose attended or unattended testing, stop on errors, or print or file an error log.

CAUTION: If attended testing is selected, the test itself may result in data loss.

IMPORTANT: When you run the TEST utility, be sure to record any error message numbers.

7. Follow the instructions on the screen as the diagnostic tests are run on the devices. When the testing is complete, the test option menu is displayed again.
8. Exit to the Compaq Utilities menu.

View System Information (INSPECT)

The View System Information (INSPECT) utility provides information about the system after it has been configured, including:

- Contents of the operating system startup files
- Current memory configuration
- ROM versions
- Type of processor and coprocessor
- Diskette, CD-ROM, DVD-ROM, tape, and hard drives installed
- Active printer and communications interfaces
- Modem
- Graphics

Managing a Diagnostics Partition

This option allows you to create, delete, or upgrade the diagnostics software on the hard drive partition. This must be performed from a diagnostics diskette.

CAUTION: Creating a diagnostics partition involves performing a low-level format on the hard drive. Normally, this is only done to add diagnostics to a replacement hard drive. If the diagnostics software is deleted, you will no longer be able to access the Compaq Utilities menu.

CAUTION: If you install an operating system without first installing the diagnostics partition, you will not be able to install a diagnostics partition without losing all data on your hard disk.

Diagnostic Error Codes

Diagnostic error codes occur if the system recognizes a problem while running the Compaq Setup and Diagnostics utilities. These error codes help identify defective subassemblies.

The following tables list possible error codes, descriptions of each error condition, and actions required to resolve the error condition. For assistance in the removal and replacement of a particular subassembly, see Chapter 3.

NOTE: Retest the system after completing each step. If the problem has been resolved, do not proceed with the remaining steps**.**

If you encounter an error condition, complete the following steps before starting problem isolation procedures:

1. Ensure proper ventilation. The workstation should have a 6-inch (15 cm) clearance at the rear of the chassis.
2. Turn off the workstation and peripheral devices.

CAUTION: Always make sure that the power is off before disconnecting or reconnecting the mouse, keyboard, or any other peripheral devices. Disconnecting or connecting any peripheral devices while the unit power is on can damage the system board.

3. Disconnect any peripheral devices other than the monitor and keyboard. Do not disconnect the printer if you want to test it or use it to log error messages.
4. Install loop-back and terminating plugs for complete testing.
5. Run the Diagnostics diskette.

Microprocessor

Table 4-13
Microprocessor Test Error Codes

Error Code	Description	Recommended Action
101-xx	CPU test failed.	Replace the system board and retest.
102-xx	Coprocessor error.	1. Run Computer Checkup or Computer Setup and retest. 2. Replace the processor and retest.
103-xx	DMA controller failed.	Replace the system board and retest.
104-xx	Interrupt controller failed.	Replace the system board and retest.
105-xx	Port error.	Replace the system board and retest.
106-xx	Keyboard controller self-test failed.	Replace the system board and retest.
107-xx	CMOS RAM test failed.	The following steps apply to error codes 107-xx through 109-xx: 1. Replace the battery/clock module and retest. 2. Replace the system board and retest.
108-xx	CMOS interrupt test failed.	
109-xx	CMOS clock test failed.	
110-xx	Programmable timer test failed.	Replace the system board and retest.
113-01	Protected mode test failed.	Replace the system board and retest.
114-01	Speaker test failed.	1. Verify the speaker connection. 2. Replace the system board and retest.
199-xx	Installed devices test failed.	1. Check system configuration. 2. Verify cable connections. 3. Check switch settings. 4. Run the Setup and Diagnostics utility. 5. Replace the system board and retest.

Memory

Table 4-14
Memory Test Error Codes

Error Code	Description	Recommended Action
200-xx	Memory machine ID test failed.	Insert DIMM in the correct location.
202-xx	Memory system ROM checksum failed.	The following steps apply to error codes 202-xx through 215-xx:
203-xx	Memory write/read test failed.	1. Remove one pair of DIMM at a time until the error message stops.
204-xx	Memory address test failed.	2. Replace other removed DIMMs one pair at a time, testing each to ensure the error does not return.
211-xx	Random pattern test failed.	3. Replace the system board and retest.
214-xx	Noise test failed.	
215-xx	Random address test failed.	

Keyboard

Table 4-15
Keyboard Test Error Codes

Error Code	Description	Recommended Action
300-xx	Keyboard ID test failed.	The following steps apply to error codes 300-xx through 304-xx:
301-xx	Keyboard self-test/interface test failed.	1. Check the keyboard connection. If disconnected, turn the computer off and connect the keyboard.
302-xx	Individual key test failed.	2. Replace the keyboard and retest.
304-xx	Keyboard repeat test failed.	3. Replace the system board and retest.

Printer

Table 4-16
Parallel Printer Test Error Codes

Error Code	Description	Recommended Action
401-xx	Printer failed or is not connected.	The following steps apply to 401-xx through 403-xx: 1. Connect the printer. 2. Check power to the printer. 3. Install the loop-back connector and retest. 4. Replace system board and retest.
402-xx	Printer port test failed.	
403-xx	Printer pattern test failed.	

Diskette Drive

Table 4-17
Diskette Drive Test Error Codes

Error Code	Description	Recommended Action
600-xx	Diskette ID drive types test failed.	The following steps apply to error codes 600-xx through 698-xx: 1. Replace the diskette media and retest. 2. Check and/or replace the diskette power and signal cables and retest. 3. Replace the diskette drive and retest. 4. Replace the system board and retest.
601-xx	Diskette format failed.	
602-xx	Diskette read test failed.	
603-xx	Diskette write, read, compare test failed.	
604-xx	Diskette random seek test failed.	
605-xx	Diskette ID media test failed.	
606-xx	Diskette speed test failed.	
609-xx	Diskette reset controller failed.	
610-xx	Diskette change line test failed.	
697-xx	Diskette type error	
698-xx	Diskette drive speed is not within limits.	
699-xx	Diskette drive/media error	1. Replace media. 2. Run Computer Setup and Computer Checkup.

Serial Port

Table 4-18
Serial Test Error Codes

Error Code	Description	Recommended Action
1101-xx	Serial port test failed.	1. Run Computer Setup. 2. Replace the system board and retest.

Modem

Table 4-19
Modem Communications Test Error Codes

Error Code	Description	Recommended Action
1201-xx	Modem internal test failed.	The following steps apply to error codes 1201-xx through 1210-xx:
1202-xx	Modem time-out test failed.	1. Disconnect from the phone line and retest.
1203-xx	Modem external termination test failed.	2. Check the phone number.
1204-xx	Modem auto originate test failed.	3. Check the modem line.
1205-xx	Modem auto answer test failed.	4. Replace the modem and retest.
1210-xx	Modem direct connect test failed.	

Pointing Device

Table 4-20
Pointing Device Test Error Codes

Error Code	Description	Recommended Action
8601-xx	Mouse test failed.	The following steps apply to 8601-xx and 8602-xx error codes:
8602-xx	Interface test failed.	1. Replace with a working pointing device and retest. 2. Replace the system board and retest.

CD-ROM Drive (IDE)

Table 4-21
CD-ROM Drive (IDE) Test Error Codes

Error Code	Description	Recommended Action
3301-xx	CD-ROM drive read test failed.	The following steps apply to error codes 3301-xx through 3305-xx and 6600-xx through 6623-xx:
3305-xx	CD-ROM drive seek test failed.	1. Replace the CD and retest.
6600-xx	ID test failed.	2. Check the jumper settings on the CD-ROM drive.
6605-xx	Read test failed.	3. Verify that the speaker is connected.
6608-xx	Controller test failed.	4. Check and/or replace the power and signal cables and retest.
6623-xx	Random read test failed.	5. Replace the CD-ROM drive and retest.
		6. Replace the system board and retest.

Tape Drive

Table 4-22
Tape Drive Test Error Codes

Error Code	Description	Recommended Action
1900-xx	Tape drive ID test failed.	The following steps apply to error codes 1900-xx through 1906-xx:
1901-xx	Tape drive servo test failed.	1. Replace the tape cartridge and retest.
1902-xx	Tape drive format or format verification test failed.	2. Check the switch settings and terminations on the tape drive.
1903-xx	Tape drive sensor test failed.	3. Check and/or replace the signal cable and retest.
1904-xx	Tape drive BOT/EOT test failed.	4. Replace the tape drive and retest.
1905-xx	Tape drive read test failed.	5. Replace the system board and retest.
1906-xx	Tape drive write/read/compare test failed.	

Video

Table 4-23
Video Test Error Codes

Error Code	Description	Recommended Action
501-xx	Graphics controller test failed.	The following error codes apply to error codes 501-xx through 516-xx:
502-xx	Video memory test failed.	1. Replace the monitor and retest.
503-xx	Video attribute test failed.	2. Replace the graphics controller and retest.
504-xx	Video character set test failed.	
505-xx	Video 80 × 25 mode 9 × 14 character cell test failed.	
506-xx	Video 80 × 25 mode 8 × 8 character cell test failed.	
507-xx	Video 40 × 25 mode test failed.	
508-xx	Video 320 × 200 mode color set 0 test failed.	
509-xx	Video 320 × 200 mode color set 1 test failed.	
510-xx	Video 640 × 200 mode test failed.	
511-xx	Video screen memory page test failed.	
512-xx	Video gray scale test failed.	
514-xx	Video white screen test failed.	
516-xx	Video noise pattern test failed.	
2402-xx	Video memory test failed.	The following steps apply to error codes 2402-xx to 2410-xx:
2403-xx	Video attribute test failed.	1. Run the Setup and Diagnostics utilities.
2404-xx	Video character set test failed.	2. Replace the monitor and retest.
2405-xx	Video 80 × 25 mode 9 × 14 character cell test failed.	3. Replace the graphics controller and retest.
2406-xx	Video 80 × 25 mode 8 × 8 character cell test failed.	
2408-xx	Video 320 × 200 mode color set 0 test failed.	
2409-xx	Video 320 × 200 mode color set 1 test failed.	
2410-xx	Video 640 × 200 mode test failed.	

Continued

Video Test Error Codes *Continued*

Error Code	Description	Recommended Action
2411-xx	Video screen memory page test failed.	The following steps apply to error codes 2411-xx through 2456-xx:
2412-xx	Video gray scale test failed.	1. Run the Setup and Diagnostics utilities.
		2. Replace the monitor and retest.
2414-xx	Video white screen test failed.	3. Replace the graphics controller and retest.
2416-xx	Video noise pattern test failed.	
2418-xx	ECG/VGC memory test failed.	
2419-xx	ECG/VGC ROM checksum test failed.	
2421-xx	ECG/VGC 640 × 200 graphics mode test failed.	
2422-xx	ECG/VGC 640 × 350 16-color set test failed.	
2423-xx	ECG/VGC 640 × 350 64-color set test failed.	
2424-xx	ECG/VGC monochrome text mode test failed.	
2425-xx	ECG/VGC monochrome graphics mode test failed.	
2431-xx	640 × 480 graphics test failed.	
2432-xx	320 × 200 graphics (256 color mode) test failed.	
2448-xx	Advanced VGA Controller test failed.	
2451-xx	132-column Advanced VGA test failed.	
2456-xx	Advanced VGA 256 color test failed.	
2458-xx	Advanced VGA Bit BLT test failed.	The following steps apply to error codes 2458-xx through 2480-xx:
2468-xx	Advanced VGA DAC test failed.	1. Replace the graphics controller and retest.
2477-xx	Advanced VGA data path test failed.	2. Replace the system board and retest.
2478-xx	Advanced VGA Bit BLT test failed.	
2480-xx	Advanced VGA Linedraw test failed.	

Audio

Table 4-24
Audio Test Error Codes

Error Code	Description	Recommended Action
3206-xx	Audio System Internal Error	Replace the system board and retest.

Network Interface

Table 4-25
Network Interface Test Error Codes

Error Code	Description	Recommended Action
6000-xx	Network ID test failed.	The following steps apply to error codes 6000-xx through 6089-xx:
6014-xx	Network configuration test failed.	1. Turn the workstation off then on (cold boot) and run Computer Setup. 2. Verify test procedures. 3. Replace the network board, if installed. 4. Replace the system board and retest.
6016-xx	Network reset test failed.	
6028-xx	Network internal test failed.	
6029-xx	Network external test failed.	
6054-xx	Network configuration test failed.	
6056-xx	Network reset test failed.	
6068-xx	Network internal test failed.	
6069-xx	Network external test failed.	
6089-xx	Network open test failed.	

SCSI Error Codes

This section includes the error codes for the following SCSI devices:

- Hard drives
- CD-ROM drives
- Tape drives

The SCSI error codes are written in the format AABB-CC and can be determined by looking up the respective parts of the code in the three corresponding tables numbered 4-26, 4-27, and 4-28.

- AA (Table 4-26) identifies the drive type being tested.
- BB (Table 4-27) identifies the type of test.
- CC (Table 4-28) identifies the exact error received.

For example, if you received a diagnostic error code of 6523-05, you would look at Table 4-26 to identify the meaning of the first two numbers, 65. This indicates a hard drive problem. The second set of two numbers, 23, refers to a random read, as shown in Table 4-27. The last two numbers, 05, indicate a seek failure, as listed in Table 4-28. When you combine this information, you know that the diagnostics program was testing the random-read functioning of the hard drive and received a seek failure. The device is faulty and must be replaced.

Table 4-26
SCSI Device Names

Error Code	Device
65XX-XX	Hard Drive
66XX-XX	CD-ROM Drive
67XX-XX	Tape Drive

Table 4-27
SCSI Test Names

Error Code	Failure
XX00-XX	ID
XX05-XX	Read
XX06-XX	SA/Media
XX23-XX	Random Read
XX28-XX	Media load/unload

Table 4-28
SCSI Test Error Codes

Error Code	Description	Recommended Action
XXXX-02	Drive not installed.	Check cable connections.
XXXX-03	Media not in drive.	Check for and install DATA CD or write-enabled tape in drive.
XXXX-05	Seek failure	Replace the indicated device.
XXXX-06	Drive timed out.	Replace the indicated device.
XXXX-07	Drive busy.	Replace the indicated device.
XXXX-08	Drive already reserved.	Replace the indicated device.
XXXX-09	Unknown	
XXXX-10	Unknown	
XXXX-11	Media soft error	Replace the indicated device.
XXXX-12	Drive not ready.	Replace the indicated device.
XXXX-13	Media error	Replace the indicated device.
XXXX-14	Drive hardware error	Replace the indicated device.
XXXX-15	Illegal drive command	Replace the indicated device.
XXXX-16	Media was changed.	Replace the indicated device.
XXXX-17	Tape write-protected.	1.Disable write-protect on tape cartridge. 2.Replace tape drive.
XXXX-18	No data detected.	Replace the indicated device.
XXXX-21	Drive command aborted.	Replace the indicated device.
65XX-24	Media hard error	1. Back up data and perform Surface Analysis to reallocate defect. 2. Replace drive.
66XX-24	Media hard error	1. Replace current DATA CD with different DATA CD and attempt to read. 2. Replace drive.
67XX-24	Media hard error	1. Ensure correct media type for this tape drive. 2. Replace current tape with new tape. 3. Replace tape drive.
XXXX-25	Unknown	

Continued

SCSI Test Error Codes *Continued*

Error Code	Description	Recommended Action
XXXX-30	Controller timed out.	Replace the indicated device.
XXXX-31	Unrecoverable error	Replace the indicated device.
XXXX-32	Controller/drive disconnected.	Replace the indicated device.
XXXX-33	Illegal controller command	Replace the indicated device.
XXXX-34	Invalid SCSI bus phase	Replace the indicated device.
XXXX-35	Invalid SCSI bus phase	Replace the indicated device.
XXXX-36	Invalid SCSI bus phase	Replace the indicated device.
XXXX-39	Error status from drive	Replace the indicated device.
XXXX-40	Target timed out.	Replace the indicated device.
XXXX-41	SCSI bus stayed busy.	Replace the indicated device.
XXXX-42	ACK/REQ lines bad.	Replace the indicated device.
XXXX-43	ACK did not deassert.	Replace the indicated device.
XXXX-44	Parity error	Replace the indicated device.
XXXX-50	Data pins bad.	Replace the indicated device.
XXXX-51	Data line 7 bad.	Replace the indicated device.
XXXX-52	MSG, C/D, and/or I/O lines bad.	Replace the indicated device.
XXXX-53	BSY never went busy.	Replace the indicated device.
XXXX-54	BSY stayed busy.	Replace the indicated device.
XXXX-60	Controller CONFIG-1 register bad.	Replace the indicated device.
XXXX-61	Controller CONFIG-2 register bad.	Replace the indicated device.
XXXX-65	Media not unloaded.	Replace the indicated device.
XXXX-90	Fan failure	1. Verify fan(s) connections. 2. Replace nonfunctional fan(s).
XXXX-91	Over Temperature	1. Ensure proper air flow. 2. Perform required maintenance and cleaning.
XXXX-99	Autoloader reported tapes not loaded properly.	1. Install tape(s) in autoloader tape drive according to test instructions. 2. Change autoloader magazine.

Upgrading the ROM

If the Compaq Professional Workstation AP500 does not have a Setup Password enabled, the ROM is not write-protected and unauthorized updates can occur. If you need or want to upgrade the system ROM, you can:

- Order an upgraded ROMPaq diskette from Compaq.
- Order the *Compaq Support Software CD Kit.*
- Download the latest ROMPaq images from the Compaq website at www.compaq.com.

IMPORTANT: To ensure maximum ROM protection, establish a Setup Password. A Setup Password prevents unauthorized ROM upgrades.

Local ROM Upgrade

To upgrade the ROM:

1. Insert the ROMPaq diskette in the diskette drive and turn on the workstation.

CAUTION: To guard against unauthorized updates of the Flash ROM or the System BIOS, the Setup Password **must** be set. See Chapter 5 for procedures on establishing a Setup Password.

2. If prompted, enter the Setup Password.

   NOTE: If the Setup Password is entered correctly, the ROMPaq utility will take over and run the ROM upgrade. If the Setup Password is incorrectly entered, the procedure will terminate and no changes will be made to the ROM.

3. When the utility finishes upgrading the ROM, remove the diskette from the diskette drive and restart the workstation.

IMPORTANT: Do not turn off the power to the workstation until the ROMPaq utility has completed the upgrade process.

Remote ROM Flash

Remote ROM Flash allows the system administrator to safely upgrade the ROM on remote Compaq workstations, directly from the centralized network management console. Enabling the system administrator to perform this task remotely, on multiple workstations, results in a consistent deployment of and greater control over workstation ROM images over the network. It also results in greater productivity and lowers total cost of ownership.

Compaq created the Remote ROM Flash capability to be secure and fail-safe. All workstation ROMPaq ROM images from Compaq are digitally signed to ensure authenticity and minimize potential corruption. The ROM firmware includes a Boot Block that is protected during the flash process and allows the workstation to be restarted, in the unlikely event of an unsuccessful ROM flash.

Remote ROM Flash is performed in two stages:

1. The system administrator uses the Remote Management Setup software on a centralized management console to prepare the workstation ROMPaq file.
2. The system administrator uses a PC LAN management product, such as Microsoft SMS, Intel LANDesk Manager, or Symantec Norton Administrator for Networks, to distribute and execute the file over the network to remote workstations.

   NOTE: The workstation must be powered on, or turned on through Remote Wakeup, to take advantage of Remote ROM Flash. Use of Remote ROM Flash also requires an established Setup Password.

For more information on enabling Remote ROM Flash, refer to the online *Remote Management Administrators Guide.* The *Remote Management Administrators Guide* is included with the Remote Management Administration Tools. It is also available in the Support Software CD Kit or at the Compaq website at www.compaq.com.

FailSafe Boot Block ROM

The FailSafe Boot Block ROM enables system recovery in the unlikely event of a system ROM upgrade failure, for example, if a power failure occurs during a system ROM upgrade. The Boot Block is a flash-protected section of the ROM that checks to validate the system ROM each time power to the system is turned on.

- If the system ROM is valid, the system starts normally.
- If the system ROM fails the validation check, the FailSafe Boot Block ROM provides enough support to start the system from a ROMPaq diskette, which programs the system ROM with a valid image.

IMPORTANT: The workstation ships with the Diskette Boot feature enabled. If the diskette drive is disabled, the FailSafe Boot Block ROM will override the disabled component to accommodate a system ROM recovery in the event a system ROM failure occurs.

Because there is no video or hard drive support from the Boot Block ROM, the keyboard lights communicate information. When the Boot Block detects an invalid system ROM, the system sounds a series of beeps (one long and three short) and flashes the three keyboard lights.

To recover the system after hearing the FailSafe Boot Block beeps:

1. Remove any diskettes from the diskette drive and turn off the power.
2. Insert a user ROMPaq diskette into the diskette drive.
3. Turn on power to the system.

   If a Setup Password has been established, the Caps Lock light will turn on.
4. Enter the Setup Password.

   When the system successfully starts from the diskette and reprograms the ROM, the following three keyboard lights will turn on.

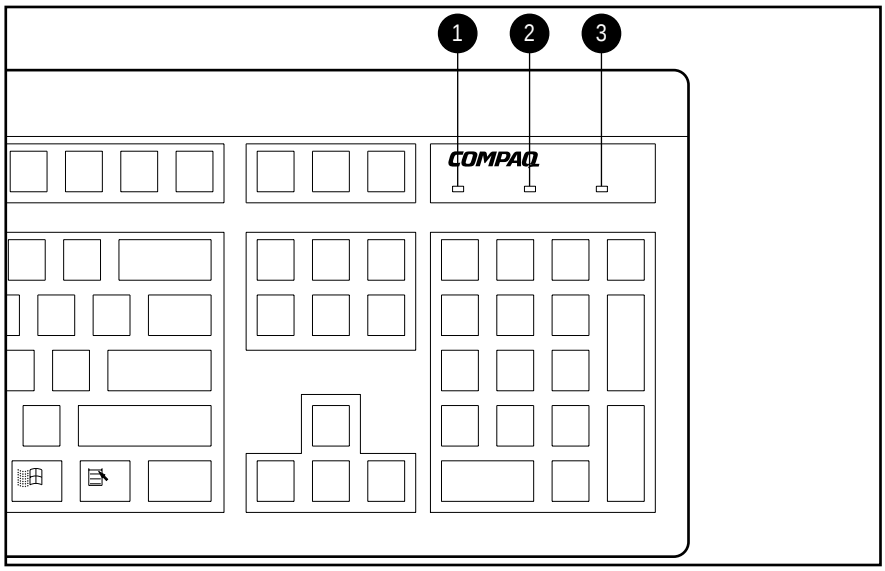


Figure 4-1. Identifying keyboard lights

The following table lists the various keyboard light combinations, as well as the meaning and action associated with each combination.

Table 4-29
Keyboard Lights

Num Lock ❶	Caps Lock ❷	Scroll Lock ❸	Meaning and Required Action
OFF	ON	OFF	System requires Setup Password. Enter the Setup Password. The light remains turned on until you enter a valid Setup Password.
ON	OFF	OFF	System could not start from diskette because the ROMPaq diskette is not present, is bad, or the drive is not ready. Insert a valid ROMPaq diskette, turn the power off, then turn the power on.
OFF	OFF	ON	ROM upgrade failed. Try another ROMPaq diskette. If the light remains turned on, contact Compaq customer support.
ON	ON	ON	ROM upgrade successfully completed. Turn power off and back on to resume normal system operation.

Compaq Insight Manager

Using the industry-standard Simple Network Management Protocol found in Microsoft Windows NT, Compaq Insight Manager allows the system administrator to view AssetControl data, configuration data, memory change alerts, NIC performance data, and contact information from a remote location.

Compaq Insight Manager also provides the following features to help you support the Compaq Professional Workstation AP500:

- Remote alerts for Pentium Pro, Pentium II and Pentium III processor prefailure, ECC DIMM memory single-bit error prefailure, and SCSI disk drive prefailure notification
- Alerts logged to the local Windows NT Event Log (logged by the Insight Manager)
- Asset and configuration information collected in a database and accessed by the Insight Manager console for remote tracking of workstation assets and configurations
- Print configuration (similar to INSPECT) reports at the Insight Manager console for remote workstations
- Setting performance thresholds on a workstation; you can receive an alert when a threshold is exceeded (such as PCI bus utilization threshold or disk volume usage threshold).
- Remote warm and/or cold reboot of a workstation
- Version Control to view versions of Compaq drivers, and system ROM currently running on a remote workstation; you can receive a recommendation on updates available from Compaq.
- Alpha pager forwarding to provide workstation alerts to an alpha or numeric pager
- Ability to view health logs on remote workstations to see previous Power-On Self Test (POST) errors, critical errors, and ECC memory errors
- Environment alerts for workstations with a temperature out of the normal range; you can also be alerted when the hood is removed.
- Out-of-band management through a modem using point-to-point protocol (PPP) for workstations not connected to a network

Compaq Workstation SSD for Windows NT

The Compaq Workstation SSD for Windows NT contains support software and utilities that enable you to take advantage of specific capabilities offered on the Compaq Professional Workstation. This support software is provided for use with Windows NT Workstation 4.0 on Compaq hardware only.

You can install the following support software using the Compaq Workstation SSD for Windows NT:

- ESS audio driver
- Graphics display drivers
- Network and storage drivers
- Systems management driver
- Logitech OEM drivers

IMPORTANT: When servicing the workstation, make sure that it is running the latest version of the Compaq Workstation SSD for Windows NT drivers for optimum performance. To determine the version of SSD installed on the workstation, look at the version in the file properties of the *SETUPAPP.EXE* file in the \WINNT\SYSTEM32\CPQNTSSD workstation directory.

Remote Capability

This feature allows the ability to install, remove, update, and configure components remotely by machine name (computer name); supports distributed computing environment (DCE) perspectives.

Silent Setup Command Line Interface

This feature provides the functionality of the Graphical User Interface (GUI) in a silent command line interface and provides execution output in a log file; provides the ability to remotely install or update drivers on multiple remote machines at one time. Also useful for Microsoft Systems Management Server Configurations.

For more information about the Compaq Workstation SSD for Windows NT, read the *NTREADME.HLP* file or run the *README. BAT* file in the \NTSSD subdirectory on the SmartStart for Workstations CD.

NOTE: To obtain the latest support software, including support software for Microsoft Windows NT 4.0, Windows NT 3.51, and Windows 95, updates are available with a subscription to the *Compaq Support Software CD Kit*. The Support Software Management order form included with the Compaq Professional Workstation provides information on how to purchase a subscription. You can also obtain the latest support software from the Compaq website at www.compaq.com.

Compaq Diagnostics for Windows NT

Compaq Diagnostics for Windows NT allows you to view information about your workstation's hardware and software configuration from within the Windows NT environment. To install Compaq Diagnostics for Windows NT, refer to the *Software Installation Guide*.

To use Compaq Diagnostics for Windows NT:

1. Double-click the Compaq Diagnostics for Windows NT icon located in the Control Panel.

   The screen displays an overview of the workstation hardware and software.

2. For specific hardware and software information, select a category from the Categories menu or from the toolbar. As you move your cursor over the toolbar icons, the corresponding category names appear.

3. Click *More* in the Information Level box to additional detailed information in a selected category.

   Information displayed by Compaq Diagnostics for Windows NT may vary slightly from, the information presented in the View System Information (INSPECT).

4. Review, print, and if necessary, discuss this information with your authorized Compaq reseller or service provider. To print the information:

5. Click *File*, then select *Print*.

6. Select one of the following options:

   - ❑ Detailed Report (All Categories),
   - ❑ Summary Report (All Categories),
   - ❑ Current Category.

7. Click *OK* to print the selected report.

To exit Compaq Diagnostics for Windows NT, click *File*, then click *Exit*.

Chapter 5
System Security

This chapter identifies and explains the following:

- Security features
- Advanced security management

Security Features

The Compaq Professional Workstation AP500 is equipped with features that secure valuable components and system integrity. The following table identifies and explains the security features.

Table 5-1

Security Features

Feature	Purpose	How It Is Established
Setup Password	Allows configuration to be changed.	Computer Setup
Power-On Password	Prevents use of the workstation when the workstation is restarted unless the Power-On Password is entered.	Computer Setup; SW1-S2
Windows NT Workstation Password	Prevents use of the computer when Windows NT Workstation starts up unless the password is entered.	Run User Manager by clicking *Start*, *Programs*, *Administrator Tools*
QuickLock/ QuickBlank	Disables keyboard and can blank the screen without exiting application; enabled with a Power-On Password.	Computer Setup
Serial or Parallel Interface Control (Must be used in combination with the Power-On Password.)	Prevents transfer of data through the integrated serial or parallel interface.	Computer Setup
Diskette Drive Boot Control	Prevents startup from the diskette drive.	Computer Setup
Diskette Drive Write Control	Prevents writing to the diskette drive.	Computer Setup
Cable Lock Provision	Inhibits access to the interior of the workstation to prevent unwanted configuration changes or component removal. Can also be used to secure the workstation to a fixed object.	Install a padlock with the security bracket to inhibit access to the interior of the workstation; add a cable lock to secure the workstation to a fixed object.

Password Security

The workstation supports security password features that can be established through the Compaq Computer Setup menu.

Establishing a Setup Password Using Computer Setup

To establish a Setup Password:

1. Turn on or restart the workstation.
2. When you see the words **F10=Setup** in the bottom-right corner of the screen, press **F10**.

   NOTE: If you do not press **F10** while the message is displayed, you must turn off the workstation, then on again, to access the utility.

3. Press **Enter** to bypass the welcome screens and display the Compaq Utilities menu.
4. From the Compaq Utilities menu, select *Computer Setup* and press **Enter.**
5. In the Computer Setup window, click *Built-in Devices.*
6. In the Built-in Devices window, click *Security Management.*
7. Under *Setup Password*, select *Enable Setup Password* and follow the instructions on the screen.
8. Save the configuration and exit the utility.
9. Turn off the workstation, then turn it on to establish the password.

Establishing a Power-On Password Using Computer Setup

To establish a Power-On Password:

1. Turn on or restart the workstation.
2. When you see the words **F10=Setup** in the bottom-right corner of the screen, press **F10.**

   NOTE: If you do not press **F10** while the message is displayed, you must turn off the workstation, then on again, to access the utility.

3. When prompted, select the desired language.
4. Press **Enter** to bypass the welcome screens and display the Compaq Utilities menu.
5. From the Compaq Utilities menu, select *Computer Setup,* then press **Enter.**
6. In the Computer Setup window, click *Built-in Devices.*
7. In the Built-in Devices window, click *Security Management.*
8. Under *Power-On Password,* click *Set* and follow the instructions on the screen.
9. Save the configuration and exit the utility.
10. Turn off the workstation, then turn it on to establish the password.

Entering a Power-On Password

To enter the Power-On Password:

1. Turn on or restart the workstation.
2. When the key icon ( ) displays, enter your current password carefully.

   NOTE: Type carefully; for security reasons, the characters you type do not appear on screen.

If you enter the password incorrectly, a broken key icon ( ) displays. Try again. After three unsuccessful tries, you must turn off the workstation, then turn it on again before you can continue.

Changing a Power-On or Setup Password

1. Turn on or restart the workstation. To change the Setup Password, run Computer Setup.
2. When the key icon ( ) displays, type your current password, a slash (/) or alternate delimiter character, your new password, another slash (/) or alternate delimiter character, and your new password again as shown:

   current password/new password/new password

   NOTE: Type carefully; for security reasons, the characters you type do not appear on the screen. See the section “National Keyboard Delimiter Characters” section in this chapter for more information about the alternate delimiter characters.

The new password takes effect the next time you turn on the workstation.

Deleting a Power-On or Setup Password

1. Turn on or restart the workstation. To delete the Setup Password, run Computer Setup.
2. When the key icon ( ) displays, type your current password followed by a slash (/) or alternate delimiter character as shown:

   current password/

   NOTE: See the “National Keyboard Delimiter Characters” section in this chapter for more information about alternate delimiter characters.

Clearing a Power-On or Setup Password

To disable the Power-On and Setup Password features, or to clear the Power-On and Setup Passwords if you forget them and cannot access the workstation system or Computer Setup, follow these steps:

1. Turn off the workstation. Disconnect the power cord from the grounded AC outlet and from the power connector on the rear of the workstation.
2. Remove the following components:
   - ❑ side access panel
   - ❑ I/O bracket assembly (expansion board assembly)
3. On SW1, move Switch 1 to the ON position.

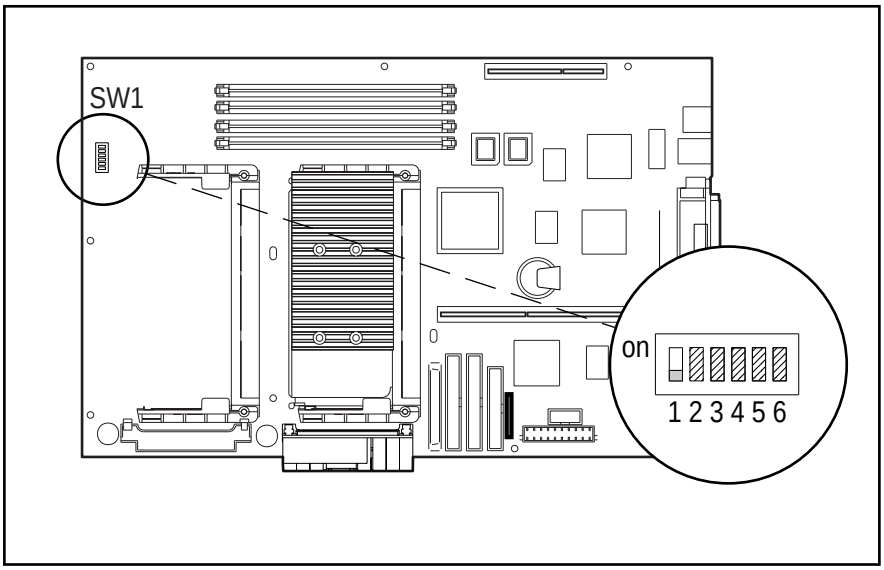


Figure 5-1. Locating the default SW1 switch

IMPORTANT: Switch 1 has a default setting of OFF. When the switch is OFF, your system is password-protected. To re-enable password protection, you **must** return the switch to its *default* position later in this procedure.

4. Reassemble the workstation and reconnect the power cord to the grounded AC outlet and to the power connector on the rear of the workstation.

IMPORTANT: You must replace the I/O bracket assembly before you restart the workstation. If the assembly is not properly seated, the workstation will not start.

5. Restart the workstation.
6. Turn off the workstation once more. Disconnect the power cord from the grounded AC outlet and from the power connector on the rear of the workstation.
7. Remove the side access panel and the I/O bracket assembly to access SW1 on the system board.

8. Return Switch 1 to its original default (OFF) position.
9. Establish a new Power-On Password, if desired.

> **IMPORTANT:** Clearing the Power-On Password will also clear the Setup Password. Be sure to re-establish your Setup Password after clearing the Power-On Password.

10. Reassemble and restart the workstation.

Windows NT Workstation Password

To establish a password in Windows NT Workstation:

1. Click *Start, Programs, Administrator Tools*.
2. Click *User Manager*, then follow the instructions to set a new password for "new user."

National Keyboard Delimiter Characters

Each keyboard is designed to meet country-specific requirements. The syntax and keys you use for changing or deleting the password depend on the keyboard that came with the workstation. The following table identifies the correct delimiter character for each keyboard.

Table 5-2

National Keyboard Delimiter Characters

Arabic	/	Greek	-	Slovakian	-
Belgian	=	Hungarian	-	Spanish	-
BHCSY*	-	Italian	-	Swedish/Finnish	/
Brazilian	/	Japanese	/	Swiss	-
Chinese	/	Korean	/	Taiwanese	/
Czech	-	Latin American	-	Thai	/
Danish	-	Norwegian	-	Turkish	.
French	!	Polish	-	U.K. English	/
French Canadian	é	Portuguese	-	U.S. English	/
German	-	Russian	/		

* For Bosnia-Herzegovina, Croatia, Slovenia, and Yugoslavia

Advanced Security Management

You can access the following security features through the Computer Setup option on the Compaq Configuration and Diagnostic menu.

- Storage (under Built-in Devices)
- Disable removable media boot ability
- Disable removable media write ability
- Communication (under Built-in Devices)
- Disable serial port
- Disable parallel port
- Security Management (under Built-in Devices)
- QuickLock/QuickBlank
- Cable Lock Provision

Re-enabling Diskette Boot or Diskette Write

The workstation ships with the Diskette Boot or Diskette Write features enabled. If a user has disabled the factory settings that allow the workstation to be booted from a diskette or to prohibit a user from saving data to a diskette, you may need to re-enable the features in order to service the workstation. To enable Diskette Boot or Diskette Write:

1. Turn on the workstation.
2. When you see the words **F10=Setup** in the bottom-right corner of the screen, press **F10**.

   NOTE: If you do not press **F10** while the message is displayed, you must turn off the workstation, then on again, to access the utility.

3. When prompted, select the desired language.
4. Press **Enter** to bypass the welcome screens and display the Compaq Utilities menu.
5. From the Compaq Utilities menu, select *Computer Setup*, then press **Enter**.
6. In the Computer Setup window, click *Built-in Devices.*
7. In the Built-in Devices window, click *Storage.*
8. Under *Removable Media,* select the function you want to enable.
9. Save the configuration and exit the utility.
10. Restart the workstation.

    NOTE: Compaq recommends that you establish the Setup Password to prevent another user from entering the Computer Setup utility and changing any settings.

Re-enabling a Serial Port or Parallel Port

To enable either of the serial ports or the parallel port:

1. Turn on the workstation.
2. When you see the words **F10=Setup** in the bottom-right corner of the screen, press **F10**.

   NOTE: If you do not press **F10** while the message is displayed, you must turn off the workstation, then on again, to access the utility.

3. When prompted, select the desired language.
4. Press **Enter** to bypass the welcome screens and display the Compaq Utilities menu.
5. From the Compaq Utilities menu, select *Computer Setup,* then press **Enter**.
6. In the Computer Setup window, click *Built-in Devices.*
7. In the Built-in Devices window, click *Communications.*
8. To enable a serial port:

   Under *Available Serial Ports,* select the port you want to enable.

   Under *Settings,* select *Enabled.*
9. To enable the parallel port:

   Under *Settings,* select *Enable.*

   Save the configuration and exit the utility.
10. Restart the workstation.

QuickLock/QuickBlank

The QuickLock and QuickBlank features disable the keyboard and mouse interfaces, and can blank the screen without exiting open applications.

IMPORTANT: You must set a Power-On Password before you can enable QuickLock or QuickBlank. For more information, see "Establishing a Power-On Password Using Computer Setup" section in this chapter.

Enabling QuickLock and QuickBlank

1. Turn on or restart the workstation.
2. When you see the words **F10=Setup** in the bottom-right corner of the screen, press **F10**.

   NOTE: If you do not press **F10** while the message is displayed, you must turn off the workstation, then on again, to access the utility.

3. When prompted, select the desired language.
4. Press **Enter** to bypass the welcome screens and display the Compaq Utilities menu.
5. From the Compaq Utilities menu, select *Computer Setup,* then press **Enter**.

6. In the Computer Setup windows, click *Built-in Devices*.
7. In the Built-in Devices window, click *Security Management.*
8. Under *Power-On Password*, select *Enable QuickLock of the Keyboard*, then select *QuickBlank the screen when locked* and/or *Initiate QuickLock when entering Energy Saver mode.*

   NOTE: To use *Initiate QuickLock when entering Energy Saver Mode,* the Power Management option must be enabled.

9. Save the configuration and exit the utility.
10. Restart the workstation.

Disabling the Keyboard and Mouse Interface

Enter the QuickLock key combination (**Ctrl+Alt+L**) to disable the keyboard and mouse (or other input device connected to the mouse connector). The applications you are running cannot be accessed, but remain in view unless the QuickBlank feature is also enabled through the Computer Setup utility.

Enabling the Keyboard and Mouse Interface

To enable the keyboard and mouse interface or other input device, enter the Power-On Password.

Cable Lock Provision

The workstation is equipped with a cable lock provision to secure the unit to a fixed object and/or inhibit access to the interior of the unit. If a cable lock or padlock is installed, you must remove it before servicing the workstation. See the “Service Preparations” section in Chapter 3 for removal procedures.

Chapter 6
Jumper and Switch Information

This chapter provides jumper and switch information for the following hardware on the Compaq Professional Workstation AP500:

- Internal and external batteries
- Processor(s)
- Hard drives (SCSI and UATA)
- CD-ROM drive
- Graphics controllers

Battery Jumpers

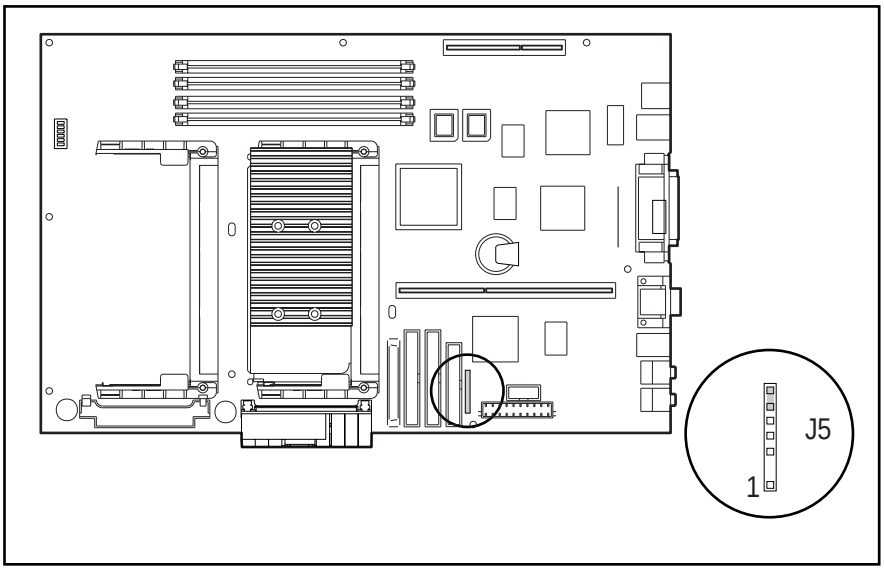


Figure 6-1. Locating the J5 Jumper

Table 6-1
System Board Configuration Jumper J5 Settings

Jumper	Setting	Function	Description
	1-4	Battery	External battery connection
J5	5-6	Battery	External battery jumper
	6-7	Battery	Internal battery jumper (default)

Switch Settings

The following illustration shows the location of SW 1. Switch 1 controls the CPU/clock speed and the Power-on Password.

S1 on Switch 1 enables the Power-on Password. The default is OFF. To reset the password, turn this switch ON.

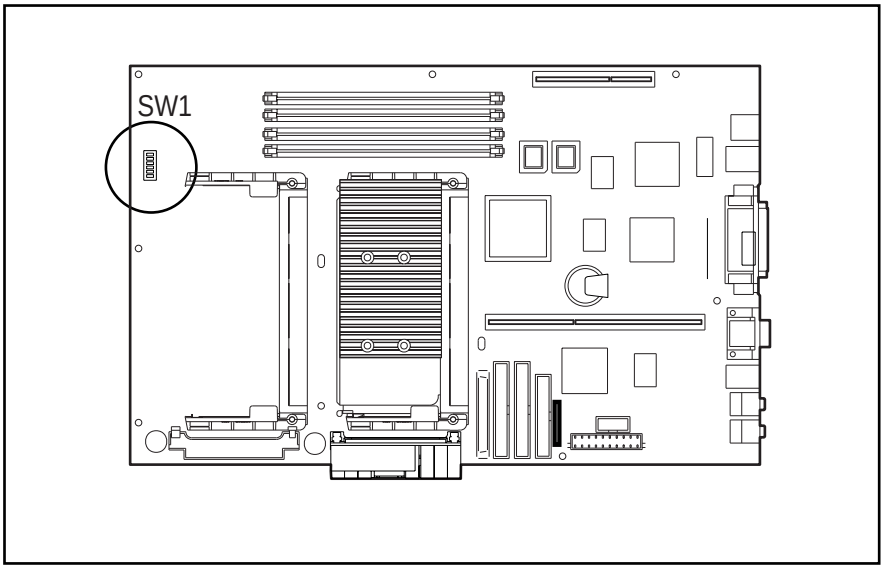


Figure 6-2. Locating the System Board SW1

Table 6-2
SW1 Settings

	S1 (Password On/Off)	S2 (Processor Speed Setting)	S3 (Processor Speed Setting)	S4 (Processor Speed Setting)	S5 (No Connect)	S6 (ACPI Power Button Overwrite)
400/100 MHz	OFF	OFF	ON	ON	OFF	OFF
450/100 MHz	OFF	OFF	ON	OFF	OFF	OFF
500/100 MHz	OFF	OFF	OFF	ON	OFF	OFF

NOTE: S1 OFF = Password enabled (default)

Hard Drives

The Compaq Professional Workstation AP500 supports Wide-Ultra and Wide Ultra2 SCSI hard drives and Ultra ATA hard drives. For specifications on your hard drive, refer to the *Service Quick Reference Guide*.

32X Max CD-ROM Drive (IDE)

The jumper settings for the 32X Max CD-ROM drive (IDE) are shown in the following illustration.

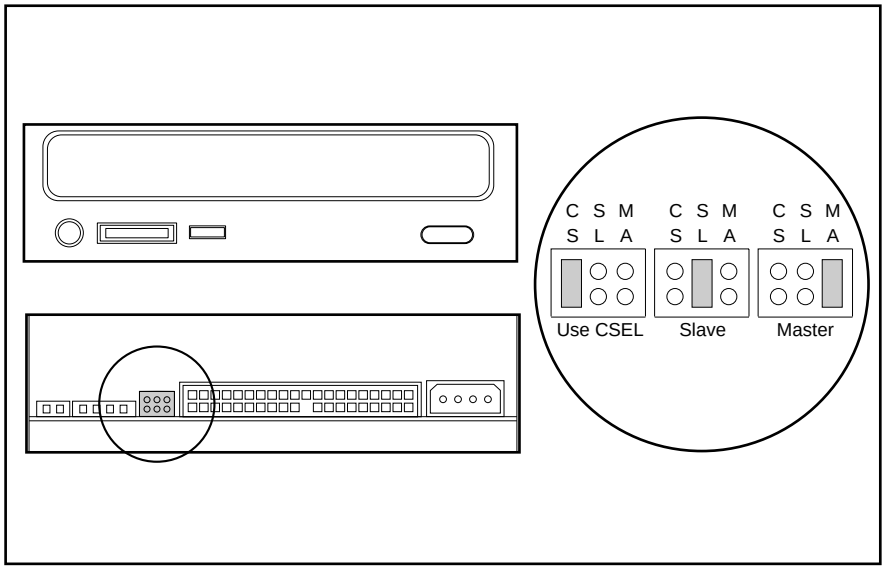


Figure 6-3. Identifying jumper positions for the 32X Max CD-ROM drive (IDE)

PowerStorm 300/AGP Graphics Controller

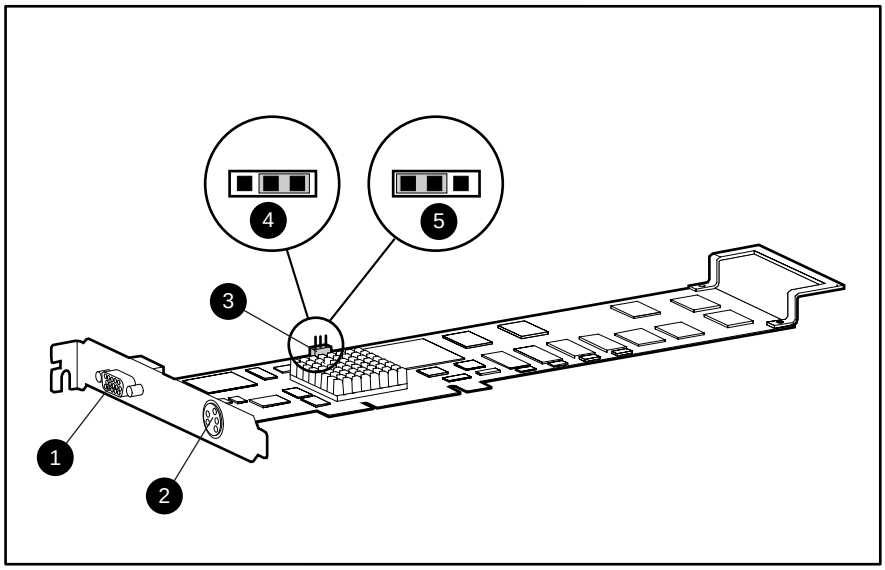


Figure 6-4. Identifying connector and jumper positions for the PowerStorm 300/AGP Graphics Controller

Table 6-3
Connector and Jumper Positions for the PowerStorm 300/AGP Graphics Controller

Identifier	Function
❶	Standard 15-pin VGA connector
❷	5-pin mini-DID stereo (3D video connector)
❸	VGA enable/disable jumper
❹	VGA enabled (default)
❺	VGA disabled

Chapter 7
Physical and Operating Specifications

This chapter provides operating and performance specifications for the following Compaq Professional Workstation AP500 components:

- System unit
- Power supply
- Diskette drive
- Zip drive
- CD-ROM and DVD-ROM drives
- Hard drives
- Audio system
- Keyboard
- Mouse (3-button)
- Graphics controllers
- Network controllers

System Unit

Table 7-1
System Specifications
(without workstation feet and front bezel)

	U. S.	Metric
Dimensions		
Height	18.70 in.	47.50 cm
Width	8.05 in.	21.08 cm
Depth	23.25 in.	59.06 cm
Weight (approximate)	54.75 lb.	28.83 kg
Power Supply		
Operating Voltage Range	90 VAC to 264 VAC	90 VAC to 264 VAC
Rated Voltage Range	100 VAC to 120 VAC	200 VAC to 240 VAC
Rated Line Frequency	50 to 60 Hz	50 to 60 Hz
Rated Input Current (maximum)	6A @ 115 VAC	3A @ 230 VAC
Power Output	325 W	325 W
Environmental Requirements		
Temperature		
Operating	40° to 95°F	5° to 35°C
Shipping	-40° to 185°F	-40° to 85°C
Relative Humidity (noncondensing)		
Operating	5% to 95%	5% to 95%
Nonoperating	5% to 95%	5% to 95%
Maximum Altitude (unpressurized)		
Operating	10,000 ft	3048 m
Nonoperating	50,000 ft	15240 m
Heat Dissipation (nominal)	1830 BTU/hr	1830 BTU/hr

Table 7-2
System Interrupts

Hardware IRQ	System Function
IRQ 0	System timer
IRQ 1	Keyboard (not on ISA Bus)
IRQ 2	Used by Interrupt Controller 2
IRQ 3	Serial port (COM 2)
IRQ 4	Serial port (COM 1)
IRQ 5	ESS sound chip
IRQ 6	Diskette drive
IRQ 7	Parallel port (LPT 1)
IRQ 8	Real-time clock
IRQ 9	Unavailable (used for ACPI support)
IRQ 10	Unused
IRQ 11	PCI Interrupts
IRQ 12	Mouse
IRQ 13	Non-catastrophic errors/CPU error
IRQ 14	Primary IDE controller
IRQ 15	Secondary IDE controller

Table 7-3
System Direct Memory Access (DMA)

Hardware DMA	System Function
DMA 0	Business audio (default)
DMA 1	Business audio (default)
DMA 2	Diskette drive
DMA 3	ECP Parallel port LPT1 (default)
DMA 4	DMA Controller cascading (not on ISA Bus)
DMA 5	Unused
DMA 6	Unused
DMA 7	Unused

Table 7-4
System I/O

I/O Address (Hex)	System Function (Shipping Configuration)
000 - 00F	DMA Controller # 1
010 - 01F	Motherboard
020 - 03F	Interrupt controller # 1
040 - 043	Counter/timer registers
044 - 04F	Unused
050 - 052	Motherboard
053 - 05F	Unused
060	Keyboard controller
061	Port B
062 - 063	Unused
064	Keyboard controller
065 - 06F	Unused
070 - 071	NMI Enable/real-time clock
072 - 079	Motherboard
07A - 07F	Unused
080 - 08F	DMA Page registers
090 - 09F	Motherboard
0A0 - 0BF	Interrupt controller # 2
0C0 - 0DF	DMA Controller # 2
0E0 - 0EF	Unused
0F0 - 0FF	Co-processor
100 - 15B	Unused
15C - 15D	Super I/O index/data register
15E - 16F	Unused
170 - 177	Fixed disk controller
178 - 1EF	Unused
1F0 - 1F7	Reserved - fixed disk controller
1F8 - 200	Unused

Continued

System I/O *Continued*

I/O Address (Hex)	System Function (Shipping Configuration)
201	Audio
202 - 21F	Unused
220 - 22F	Audio (Alternate = 240- 24F, 260 - 26F, or 280 - 28F)
230 - 273	Unused
274 - 277	ISA PnP
278 - 27F	Reserved parallel port
280 - 2E7	Unused
2E8 - 2EF	Reserved serial port
2F0 - 2F7	Unused
2F8 - 2FF	Serial port
300 - 32F	Unused
330 - 331	Audio
332 - 36F	Unused
370 - 377	Reserved - fixed disk controller
378 - 37F	Parallel port (primary)
380 - 387	Unused
388 - 38B	Audio
38C - 397	Unused
398 - 399	Motherboard
39A - 3AF	Unused
3B0 - 3BB	MDA, EGA/VGA
3BC - 3BF	Reserved (parallel port)
3C0 - 3DF	EGA/VGA
3E0 - 3E7	Unused
3E8 - 3EF	Reserved (serial port)
3F0 - 3F7	Diskette controller
3F8 - 3FF	Serial port (primary)

Table 7-5
Memory Addresses

Memory Address	Size	System Function
FFFFFFFFh to FFF80000h	512 KB	System ROM
FEEFFFFFh to FEE00000h	1024 KB	Local APIC address range
FECFFFFFh to FEC00000h	1024 KB	I/O APIC address range
C7FFFFFFh to 50000000h	1,966,080 KB	PCI Memory expansion
3FFFFFFFh to 01000000h	1,032,192 KB	HOST Memory expansion
00FFFFFFh to 00100000h	15,360 KB	HOST or ISA Memory expansion
000FFFFFh to 000F0000h	64 KB	System ROM
000EFFFFh to 000E0000h	64 KB	Expansion system ROM
000DFFFFh to 000C0000h	128 KB	Option ROM
000BFFFFh to 000A0000h	128 KB	Video RAM
0009FFFFh to 00000000h	640 KB	Base memory

1 KB = 1024 bytes. Any memory above host memory is non-cacheable.

325W Power Supply

Table 7-6
325W Power Supply Specifications

Input Specifications	Low Range	High Range
Rated input voltage	100 to 120 VAC	200 to 240 VAC
Rated input current	6A @ 115 VAC	3A @ 230 VAC
Rated input frequency	50 to 60 Hz	50 to 60 Hz
General specifications		
Input power	540W	540W
Holdup time	16ms	16ms
Full output rating	325W	325W
Minimum load	16W	16W
Ambient temperature range		
Operating	40ºF to 95ºF	5ºC to 35ºC
Storage	-40ºF to 185ºF	-40ºC to 85ºC

Diskette Drive

Table 7-7
1.44-MB Diskette Drive

Size and Capacity	
Size (in.)	3.5
High density (MB)	1.44
Low density (KB)	720
Light	Green
Height	One third
Bytes per Sector	512
Sectors per Track	
High density	18
Low density	9
Tracks per Side	
High density	80
Low density	80
Read/Write Heads	2
Average Access Time (ms)	
Track-to-track (high/low)	3/6
Average (high/low)	94/173
Latency average (ms)	100
Data Transfer Rate (Mbit/s)	
High/low (to/from media)	500/250 Kb/s

Zip Drive

Table 7-8
100-MB ZIP Drive

Data Transfer Rate	
Sustained	Up to 11.2 Mbits/sec
Burst	Up to 88.9 Mbits/sec
Seek Time (includes settling time)	
Minimum	40.0 ms
Average	29.0 ms
Maximum	55.0 ms
Latency (average rotational delay)	10.2 ms
Spindle speed	2941 rpm
Track-to-track access time	5.0 ms
Average head switch time	11.0 ms
Head reload time	200.0 ms
Start/stop time (average)	
Start	3 seconds
Stop	2 seconds
Spares Capacity	1.6 MB
Form Factor Width	98.0 mm (3.875 in)
Weight	49.6 gm (1.75 oz)
Drop height/shock	3.0 M
Insertion/removal cycles	2,000 minimum
Estimated shelf life	10 years

CD-ROM Drive

Table 7-9
32X Max Tray-Load CD-ROM Drive (IDE)

Disk	
Diameter	12 cm
Capacity	
Mode 1	540 MB
Mode 2	650 MB
Disk thickness	1.2 mm
Track pitch	1.6 µm
Performance	
Access time	
Random seek	<100 ms
Full stroke seek	<150 ms
Data transfer rate	
Sustained	150 KB/s
Burst	2100 to 4800 KB/s (14x to 32x variable)
Bus rate	4.0 MB/s
Cache/buffer	128 KB/s
Start-up time	
Single	<7 s
Multisession	<30 s
Stop-time	< 4 s
Error rates	
Soft error	10^{-9}
Hard error	10^{-12}
Seek error	10^{-6}

Continued

32X Max CD-ROM Drive (IDE) *Continued*

Dimensions	
Height	42.9 mm
Width	150.1 mm
Depth	208.0 mm
Weight	1200 g
Audio Interface	
Line out connector	
RMS Output voltage	0.7 Vrms
S/N ratio	80 dB
Channel separation	65dB
Noise	0.1%
Frequency response	20 to 20 KHz
Digital audio out connector	2-pin digital audio out connector described in the ATAPI spec., 2.6, section 11.1 must be included. This serial digital audio out must conform to the IEC-958 EIAJ CP-1201 format.
Electrical	
DC Power requirements	
5 VDC +/-5%	100 mV ripple p-p
12 VDC +/-5%	200 mV ripple p-p
DC Current	
5 VDC +/-5% (typical)	450 mA
5 VDC =/-5% (maximum)	1800 mA
12 VDC +/-5% (typical)	600 mA
12 VDC =/-5% (maximum)	1800 mA
Total drive power (standby mode)	< 1 W

DVD-ROM Drive

Table 7-10
6X Max DVD-ROM Drive

Disk	
Diameter	12 cm
Capacity	
Mode 1	4.7 GB 9.46 GB
Mode 2	550 MB (Mode 1,2,12cm) 640 MB (Mode 2,12cm) 180 MB (8 cm)
Disk thickness	1.2 mm
Track pitch	0.74 µm
Performance	
Access time (typical)	
Random seek	<180 ms
Full stroke seek	<300 ms
Data transfer rate	
Sustained	150 KB/s (sustained, 1xCD-ROM mode)
Burst	1200 to 4800 KB/s (32x CAV CD-ROM mode) 2705 to 8115 KB/s (6x CAV DVD mode)
Bus rate	4.0 MB/s
Cache/buffer	512 KB/s (minimum)
Start-up time	
Single	<10 s
Stop-time	< 3 s
Error rates	
Soft error	10^{-15}
Hard error	10^{-20}
Seek error	10^{-6}

Continued

6X Max DVD-ROM Drive *Continued*

Dimensions	
Height	41.3 mm
Width	148 mm
Depth	208.0 mm
Weight	1200 g
Audio Interface	
Line out connector	
RMS Output voltage	0.7 Vrms
S/N ratio	80 dB
Channel separation	65dB
Noise	0.1%
Frequency response	20 to 20 KHz
Digital audio out connector	2-pin digital audio out connector described in the ATAPI spec., 2.6, section 11.1 must be included. This serial digital audio out must conform to the IEC-958 EIAJ CP-1201 format.
Electrical	
DC Power requirements	
5 VDC +/-5%	100 mV ripple p-p
12 VDC +/-5%	200 mV ripple p-p
DC Current	
5 VDC +/-5% (typical)	450 mA
5 VDC =/-5% (maximum)	1800 mA
12 VDC +/-5% (typical)	600 mA
12 VDC =/-5% (maximum)	1800 mA
Total drive power (standby mode)	< 1 W

Hard Drives

Table 7-11
4.3-GB Wide-Ultra SCSI Hard Drive

	7200 rpm drive	10K rpm drive
Capacity	4.3 GB	4.3 GB
Transfer rate		
Media	13.56 to 21.58 MB/s	19 to 28.9 MB/s
Asynchronous	5.0 MB/s	10.0 MB/s
Synchronous	Up to 40.0 MB/s	Up to 40.0 MB/s
Seek time (typical)		
Single track	2.0 ms (read)	0.8 ms (read)
Average	7.5 ms (read)	5.4 ms (read)
Full stroke	15.0 ms (read)	<12.2 ms (read)
Disk rotation speed	7200 rpm	10K rpm
Cylinders	8420	6962
Data heads/cylinder	5	6
Sectors/track	165-264 (8 zones)	167-254 (11 zones)
Buffer size	384 KB	1024 KB

NOTE: Drive performance may vary slightly depending upon the vendor.

Table 7-12
9.1-GB Wide-Ultra SCSI Hard Drive 7200 rpm

Capacity	9.1 GB
Transfer rate	
Media	13.6 to 21.3 MB/s
Asynchronous	5.0 MB/s
Synchronous	Up to 40.0 MB/s
Seek time (typical)	
Single track	1.6 ms
Average	7.5 ms
Full stroke	15.0 ms
Disk rotation speed	7200 rpm
Cylinders	8419
Data heads/cylinder	10
Sectors/track	165 to 264 (8 zones)
Buffer size	384 KB

NOTE: Drive performance may vary slightly, depending upon the vendor.

Table 7-13
6.4-GB Ultra ATA Hard Drive

Capacity	6.4 GB
Drive type	65 (soft)
Transfer rate	
Media	10.38 to 17.5 MB/s
Interface	33.3 MB/s
Seek time (typical)	
Single track	2.0 ms
Average	9.5 ms
Full stroke	20.0 ms
Disk rotation speed	5400 rpm
Cylinders	13,328
Data heads (logical)	15
Sectors/track (logical)	63
Buffer size	128 to 256 KB

NOTE: Drive performance may vary slightly depending upon the vendor.

Table 7-14
10-GB Ultra ATA Hard Drive (7200 RPM)

Drive Configuration		Drive Performance	
User capacity	10.0-GB	Spin-up time (power on to not busy)	Typ. = 18 seconds Max = 31 seconds
Data cylinders Physical Logical	 13097 16383	Spin-down time	Typ. = N/A Max = 20 seconds
Data heads Physical Logical	 7 16	Seek times (busy to seek complete) Single track read (ms) Average read (ms) Full stroke read (ms)	 Typ. = 1.7; Max = 2.4 Typ. = 8.5; Max = 9.5 Typ. = 15.0; Max = 18.0
Sectors per track Physical (ID or OD) Logical	 165 to 264 63	Average latency, maximum	4.17 ms
Max LBA	19,541,087	Data transfer rate Disk to buffer (ID or OD) Interface:	 92.2 to 163.7 MB/s
Total number of LBAs	19,541,088	PIO mode 4, DMA mode 2 Ultra DMA mode 2	16.7 MB/s 33.3 MB/s
Data bytes per sector	512	RPM	7200 ± 0.1 %
Sector interleave	1:1		
Number of ECC bytes returned on RL/WL command	34		
Recording method	16/17 PRML		

NOTE: Drive performance may vary slightly depending upon the vendor.

Table 7-15
18-GB Wide Ultra2 Hard Drive (10,000 RPM)

Performance Criteria	Value
Capacity	18.2 GB
Set Capacity	18209 MB
Data Cylinders	6962
Data Heads/Cylinders	24
Sectors/Track	167-254 (11 Zones)
Data Bytes/Sector	512
Buffer Size	1024 kB
Sector Interleave	1:1
Maximum Time From	
Power On to Selection	3 seconds (from power applied)
Reset to Selection	250 ms (from power applied)
Seek Times, Typical	READWRITE
Track to Track	1.0 ms1.3 ms
Average	6.2 ms6.8 ms
Full Stroke	<18 ms<20 ms
Disk Rotation Speed, Nominal	10025 rpm
Average Latency, Maximum	2.99 ms
Max. Data Transfer Rate	
To/From Disc.	19 – 28.9 MB/s
@ Interface	
Asynchronous	10 MB/s
Synchronous	Up to 40 MB/s
Monitor and Performance Limits	
Spin-Up	45.3 sec
Test 1, Track Seek	0.9 ms
Test 2, 1/3 rd Stroke Seek	8.8 ms
Test 3, Full Seek	15.6 ms
Reallocated Sectors	7200

NOTE: Drive performance may vary slightly depending upon the vendor.

Audio System

Table 7-16
Audio System

Sampling rate	4 KHz to 48 KHz (adjustable)
Maximum voltage (rms)	
Microphone-in	0.030
Line-in	0.7
Headphone-out	N/A
Line-out	0.7
Impedance (nominal)	
Microphone-in	1-K ohm
Line-in	20-K ohms
Headphone-out	16 ohms (min)
Line-out	20-K ohms
Speaker	
Frequency response	150 Hz to 15K Hz
Data types	
alaw	8-/16-bit
µlaw	8-/16-bit
mono/stereo	16-bit

Keyboard

Table 7-17
Compaq Enhanced Keyboard

Dimensions	U.S.	Metric
Height	1.3 in.	3.3 cm
Width	18.3 in.	46.5 cm
Depth	6.4 in.	16.1 cm
Weight	3.0 lb	1.4 kg

Mouse

Table 7-18
3-Button Mouse

Dimensions	U.S.	Metric
Height	1.42 in.	3.6 cm
Length	4.17 in.	10.7 cm
Width	2.87 in.	7.4 cm
Weight	5.20 oz	150 g
Base Resolution	400 dpi	
Tracking Speed (maximum)	10 in./sec	25 cm/sec
Temperature		
Operating	32°F to 104°F	0°C to 40°C
Storage	-4°F to 140°F	-20°C to 60°C
Lifetime		
Mechanical	Exceeds 300 miles	Exceeds 483 km
Switch	Exceeds 1 million operations	Exceeds 1 million operations
Relative Humidity	10% to 90%, noncondensing	
ESD	No soft errors through 8 kV; no hard errors through 10 kV; specific performance depends on host system	

Graphics Controllers

Table 7-19
GLoria Synergy+ Graphics Controller
Maximum Color Support

Resolutions	Colors 4-MB Standard	Colors 4-MB Standard with 4-MB Upgrade	Maximum Refresh Rate
1920 x 1200	256	32K	75 Hz
1920 x 1080	256	32K	80 Hz
1600 x 1280	32K	32K	75/85 Hz
1600 x 1200	32K	32K	85 Hz
1600 x 1000	32K	32K	100 Hz
1536 x 1152	32K	32K	85 Hz
1280 x 1024	32K	16M	100/80 Hz
1152 x 864	16M	16M	100 Hz
1024 x 768	16M	16M	100 Hz
800 x 600	16M	16M	100 Hz
640 x 480	16M	16M	100 Hz

Table 7-20
Compaq PowerStorm 300 Graphics Controller
Maximum Color Support

Resolution	3D Acceleration with Double Buffering, Colors Supported	Texture Memory	Maximum Refresh Rate
1280 x 1024	16M	16 MB	85 Hz
1024 x 768	16M	16 MB	85 Hz
800 x 600	16M	16 MB	85 Hz
640 x 480	16M	16 MB	85 Hz

Table 7-21
Matrox Productiva G100 Multi-Monitor Series Graphics Controller
Maximum Display Resolutions

Graphics Memory	Colors	Maximum Display Area
4 MB	256 colors (8-bit)	1800 x 1440 / 1920 x 1200
	32/64K colors (15/16-bit)	1600 x 1200 / 1920 x 1080
	16M colors (24-bit)	1280 x 1024
	16M colors (32-bit)	1152 x 864

Table 7-22
Matrox Productiva G100 Multi-Monitor Series
Maximum Color Support

Resolutions*	Colors	Maximum Refresh Rate (Hz)
640 x 480	16.7M	200
800 x 600	16.7M	200
1024 x 768	16.7M	140
1152 x 864	16.7M	120
1280 x 1024	16.7M	100
1600 x 1200	32,768	85
1920 x 1080	65,536	75
1920 x 1200	256	70
1800 x 1440	256	65

*Maximum refresh rates are attainable when using 8- or 16-bit palettes. Maximums may not be attainable at the highest display resolutions with a 24- or 32-bit color palette.

Table 7-23
Matrox Productiva G100 Multi-Monitor Series Graphics Controller
Refresh Rates

Display Resolution*	Horizontal Refresh Rate (kHz)	Vertical Refresh Rate (Hz)
640 x 480	31-102	60-200
800 x 600	38-114	60-200
1024 x 768	48-113	60-140
1152 x 864	54-110	60-120
1280 x 1024	64-107	60-100
1600 x 1200	75-106	60-85
1920 x 1080	68-88	60-75
1920 x 1200	75-91	60-70
1800 x 1440	89-97	60-65

* Maximum refresh rates are attainable when using 8- or 16-bit color palettes. Maximums may not be attainable at the highest display resolutions with a 24- or 32-bit color palette

Table 7-24
Millennium G200 Graphics Controller
Maximum Color Support

Resolutions	Colors	Maximum Refresh Rate (Hz)
640 x 480	16.7M	200
800 x 600	16.7M	180
1024 x 768	16.7M	140
1152 x 864	16.7M	120
1280 x 1024	16.7M	100
1600 x 1200	16.7M	75
1920 x 1080	16.7M	70
1920 x 1200	16.7M	65
1800 x 1440	65,536	70

Network Controller

Table 7-25
Ethernet Network Interface Controller (NIC)

Physical connector	RJ-45	
Operating environment		
Temperature	50° to 95°F	10° to 35°C
Humidity	10% to 90%, noncondensing	
Electrical bus	32-bit PCI bus	

RJ-45 Network Cable Specifications

The RJ-45 connections use an unshielded twisted pair (UTP) cable of 22-, 24-, or 26-gauge. The cable must comply with the IEEE 802.3 10BASE-T standard. The maximum distance between the computer and the hub is 100 meters.

Chapter 8
External Connectors

This chapter provides an overview of the external connectors, including pin assignments, for the Compaq Professional Workstation AP500.

Physical Location

The following illustration identifies the physical location of each connector. See the corresponding table for connector names.

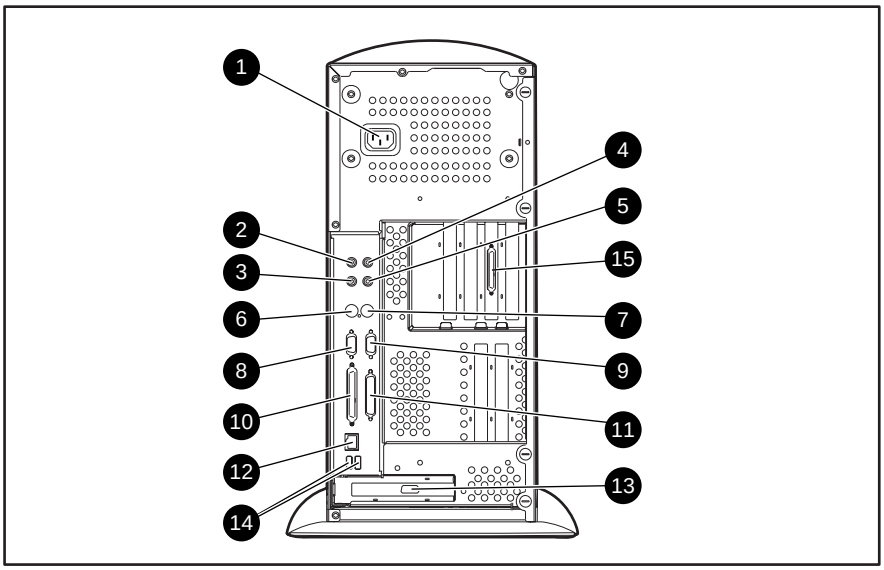


Figure 8-1. Overview of external connectors

Table 8-1
External Connectors

Reference	Connector	Function
❶	Power cord connector	Connects to the power cord
❷	Audio line-out connector	Connects to an external amplifier that powers additional speakers or a tape deck for recording
❸	Headphone jack	Connects to headphones
❹	Audio line-in connector	Connects a device that supplies sound (tape deck, CD-ROM or DVD-ROM player)
❺	Microphone jack	Connects to a microphone
❻	Keyboard connector	Connects to a keyboard (orange icon)

Continued

External Connectors *Continued*

Reference	Connector	Function
❼	Mouse connector	Connects to a mouse (green icon)
❽	Serial connector	Connects to a serial device
❾	Serial connector	Connects to a serial device
❿	Parallel connector	Connects a parallel device (printer)
⓫	Wide-Ultra SCSI connector	Connects to a SCSI device
⓬	RJ-45 connector	Connects to the Ethernet network
⓭	VGA (AGP) connector	Connects to a monitor (standard)
⓮	USB connectors (2)	Connects to USB devices
⓯	Wide Ultra2 SCSI connector	Connects a Wide Ultra2 SCSI device

Pin Assignments

Table 8-2
Keyboard

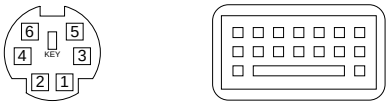
Connector and Icon (Orange)	Pin	Signal
	1	Data
	2	Unused
	3	Ground
	4	+5 VDC
	5	Clock
	6	Reserved

Table 8-3
Mouse

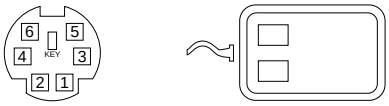
Connector and Icon (Green)	Pin	Signal
	1	Data
	2	Reserved
	3	Ground
	4	+5 VDC
	5	Clock
	6	Reserved

Table 8-4
Parallel Interface

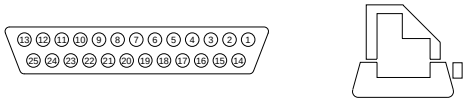
Connector and Icon	Pin	Signal
	1	Strobe
	2	Data Bit 0
	3	Data Bit 1
	4	Data Bit 2
	5	Data Bit 3
	6	Data Bit 4
	7	Data Bit 5
	8	Data Bit 6
	9	Data Bit 7
	10	Acknowledge
	11	Busy
	12	Paper end
	13	Select
	14	Auto linefeed
	15	Error
	16	Initialize printer
	17	Select IN
	18-25	Signal ground

Table 8-5
Serial Interfaces

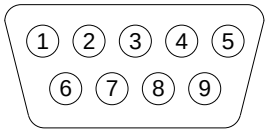
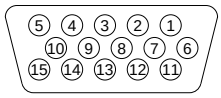
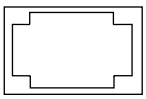
Connector and Icon	Pin	Signal
	1	Carrier detect
	2	Receive data
	3	Transmit data
	4	Data terminal ready
	5	Signal ground
	6	Data set ready
	7	Request to send
	8	Clear to send
	9	Ring indicator

Table 8-6
Monitor

Connector and Icon	Pin	Signal
 	1	Red analog
	2	Green analog
	3	Blue analog
	4	Monitor ID Bit 2
	5	Ground
	6	Ground analog
	7	Ground analog
	8	Ground analog
	9	Not connected
	10	Ground
	11	Monitor ID Bit 0
	12	Bi-directional Data (SDA)*
	13	Horizontal sync
	14	Vertical sync
	15	Data clock (SCL)*

*For DDC support (I^2C monitors)

Table 8-7
Ethernet RJ-45

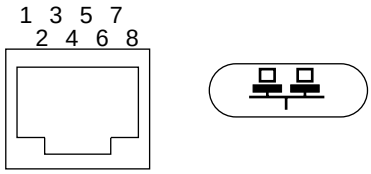
Connector and Icon	Pin	Signal
	1	(+) Transmit data
	2	(-) Transmit data
	3	(+) Receive data
	4	Unused
	5	Unused
	6	(-) Receive data
	7	Unused
	8	Unused

Table 8-8
Universal Serial Bus (USB)

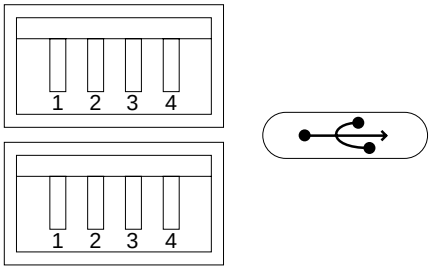
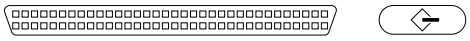
Connector and Icon	Pin	Signal
	1	VCC
	2	-Data
	3	+Data
	4	Ground

Table 8-9
SCSI Connector

Connector and Icon	
	

Pin	Signal	Pin	Signal
1-16	Ground	51 - 52	TERMPWR
17 - 18	TERMPWR	53	Reserved
19	Reserved	54	Ground
20 - 34	Ground	55	-ATN
35	-D12	56	Ground
36	-D13	57	-BSY
37	-D14	58	-ACK
38	-D15	59	-RST
39	-DP1	60	-MSG
40	-D0	61	-SEL
41	-D1	62	-C/D
42	-D2	63	-REQ
43	-D3	64	-I/O
44	-D4	65	-D8
45	-D5	66	-D9
46	-D6	67	-D10
47	-D7	68	-D11
48	-DP0		
49 - 50	Ground		

Table 8-10
Line-In Connector

Connector and Icon	Signal
	Audio In

Table 8-11

Line-Out Connector

Connector and Icon	Signal
	Audio Out

Table 8-12
Microphone Connector

Connector and Icon (Blue)	Signal
	Stereo 1/8-inch Miniphone

Table 8-13
Headphone Connector

Connector and Icon	Signal
	Stereo 1/8-inch Miniphone

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  spares part number 1-4

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